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REPORT OF THE CHIEF ENGINEER

Eugene H. Porter, M.D., *State Commissioner of Health,*
Albany, N. Y.:

Dear Sir: — I have the honor to submit herewith the annual report of the Engineering Division for the year 1909.

No changes of importance have been made during the year in methods or in administration of the work of the Division, and no essential changes have occurred in the Engineering staff. A gradual increase in the work and duties devolving upon the Engineering Division as compared to the previous three years has occurred during the past year and as previously pointed out this increase of work cannot be satisfactorily met without some corresponding additional engineering assistance.

This urgency has been partially met by the temporary addition during portions of the year of special engineering assistants which have made possible the undertaking or continuation of important work of certain special investigations. Another factor in the success of handling increased work has been along lines of perfecting methods of investigation and of systematizing the work of reporting and reading over engineering data.

In conformity with the custom of previous years, and with no apparent reason for a change, I have prepared the subject-matter of this report under substantially the same classification of heading as for the year 1907, as follows:

I.— Sewerage and Sewage Disposal.
  - (*a*) Examination and approval of plans for sewerage and sewage disposal.
  - (*b*) General investigations relating to sewerage and sewage disposal.

II.—PROTECTION OF PUBLIC WATER SUPPLIES.
- (*a*) General examination of water supplies.
- (*b*) Preparation of rules for the protection of public water supplies.
- (*c*) Inspection of violations of rules for the protection of public water supplies.
- (*d*) Special investigation of public water supplies.
- (*e*) Special investigation of water purification plants.

III.—INVESTIGATION OF OUTBREAKS OF TYPHOID FEVER.

IV.—INVESTIGATION OF COMPLAINTS RELATING TO STREAM POLLUTION.

V.—INVESTIGATION OF PUBLIC NUISANCES NOT ARISING FROM STREAM POLLUTION.

VI.—INVESTIGATIONS ORDERED BY THE GOVERNOR.

VII.—INSPECTION OF RENDERING PLANTS.

VIII.—SPECIAL INVESTIGATIONS.
- (*a*) Sanitary survey of watersheds.
- (*b*) Investigation of sanitary condition of cities and villages.
- (*c*) Investigation of illegal sewer construction.
- (*d*) Sanitary inspection of summer resorts.
- (*e*) Investigation of methods of garbage disposal in New York State.

A review of this report and a comparison of it with previous annual reports reveals very clearly that the Engineering Division is becoming more and more established on a firmer and stronger foundation, and that it is only through the perfecting of systematic methods, made possible through pressure of work and experience, that the present limited engineering organization is capable of attending to the many duties required of it under the Public Health Law and, what appears to be equally important to real sanitary progress, the performing of voluntary work of special investigations and dissemination of much-needed knowledge and advice on sanitary matters through the State. Special investigation and reports on water supplies, sanitary condition of villages, summer resorts, water filtration plants and a number of other investigations and reports of a special nature are particularly worthy of review and as a result of which, improvements and general good throughout the State has been accomplished, more than commensurate with the time and work spent upon them.

THEODORE HORTON,

Chief Engineer

December 31, 1909.

SEWERAGE AND SEWAGE DISPOSAL

EXAMINATION AND APPROVAL OF PLANS FOR SEWERAGE AND SEWAGE DISPOSAL

The Public Health and Village Laws provide generally that all plans for systems of sewerage and sewage disposal shall be submitted to, and approved by, the State Commissioner of Health before they may be constructed or put into operation. The law further provides that no sewage, factory wastes or other refuse shall be discharged into the waters of the State unless express permission be granted by the State Commissioner of Health. The duties which the Engineering Division is called upon to perform in this regard comprise the detailed examination and report on plans for all original systems of sewerage or extensions and reconstruction thereof; and the preparation of permits containing the conditions under which the discharge of sewage, sewage effluent and factory wastes into the waters of the State may be permitted.

During the past year plans for sewerage and sewage disposal were examined and permits prepared in connection with the following municipalities:

ALLEGANY

On March 12, 1908, application was made by the president of the village of Allegany for permission to discharge sewage into the Allegheny river from a sewer to serve the business section of the village. After considerable correspondence plans for sewerage were submitted in compliance with the rules and regulations of the Department and were approved on June 24, 1909, and a permit was issued allowing the discharge of sewage from the proposed sewer system into the Allegheny river.

two proposed outlet sewers and convey the same to some point west of the village to a suitable site for a sewage disposal plant.

I would, therefore, recommend that the plans be approved and a permit issued.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

PERMIT

Application having been duly made as provided by section 77 of chapter 45 of the Consolidated Laws, constituting the Public Health Law, permission is hereby given to the board of trustees of the village of Allegany to discharge sewage from the proposed sewer system into the waters of the Allegany river at the point shown by the plans within the municipality of Allegany, in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of the Allegheny river.

2. That the sewers shown by the plans to be six inches in diameter and to have a grade of 0.5 per cent. shall be either increased to eight inches, or the grades of such sewer shall be steepened to 0.6 per cent. when constructed.

3. That no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewer system.

4. That whenever required by the State Commissioner of Health, satisfactory plans for the interception and treatment of all sewage from the village shall be submitted to this Department for approval, and that such works, or any portion of such works, for the treatment of sewage as shown by the plans shall be constructed within the time specified when the said plans are approved.

5. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future appli-

cation that may be made for permission to discharge additional sewage into the waters of this State.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

ALBANY, N. Y., *June* 24, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Cattaraugus county.

AUBURN

On February 19, 1909, application was made by the common council for the approval of plans for a sanitary sewer system and disposal works for the first, sixth, and tenth wards' sewer district in the city of Auburn. These plans were approved on February 26, 1909, and a permit allowing the discharge of the effluent of the above disposal plant into Hunter brook was issued on the condition that detailed plans for the sewage disposal plant, in general accordance with the preliminary plans approved, should be submitted to and be approved by this Department before the construction of the sewer system and sewage disposal work is commenced.

On April 23, 1909, detailed plans for the sewage disposal plant were submitted in accordance with the provisions of the permit issued on February 26, 1909. On May 5, 1909, these plans were approved.

On May 10, 1909, application was received from the city engineer to delay the construction of contact filters from the above sewage disposal works. On May 11, 1909, this application was denied.

ALBANY, N. Y., *February* 26, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report on the examination of plans for a sanitary sewer system and disposal works for the first, sixth and tenth wards' sewer district in the city of Auburn, Cayuga county, submitted for approval February 19, 1909.

The plans and documents comprise the following:

1. Duplicate prints of sewer district showing location of proposed sewers and disposal works.
2. Twenty duplicate prints of profiles.
3. Duplicate prints showing plan and section of "Reduction Tank."
4. Duplicate prints showing plan and sections of disposal works.
5. Duplicate prints of details of appurtenances.
6. Short report by the designing engineer.
7. One copy of specifications.

The section of the city to be served by the proposed system lies in the east and northeast part of Auburn and covers about 1,000 acres, which constitutes about one-fifth of the total area of the city and has at present an estimated population of 2,500.

The submission of these plans is in conformity with provisions in permits granted July 16, 1907, for the construction of sewers in Seward avenue, January 9, 1908, for the construction of sewers in Elm street, and December 18, 1908, for the Fulton street extensions, all of which permits were issued on the condition that plans for a complete sewer system and disposal works for the first, sixth and tenth wards be submitted to this Department for approval between January 1, 1909, and May 1, 1909. A complete statement of the sewerage conditions in the city of Auburn is found in the Twenty-eighth Annual Report.

The plans now under consideration are for a complete sewer system and disposal works for what is known as the first, sixth and tenth wards' sewer districts. The trunk sewer of this proposed sewer system follows the natural watercourse of Hunter brook and is to intercept all the sanitary sewage from the existing separate sewers in this sewer district at an intercepting manhole near the intersection of Seward avenue and Franklin street which sewage is now being discharged directly into Hunter brook near the above manhole.

The sewers are found to be adequate as to grades and capacities to satisfactorily meet any probable demands that may reasonably be made upon them for considerable period in the future.

The disposal works consist of a settling tank and a unit of four filter beds. The settling tank as shown on the plan submitted, allowing for an eight-hour detention, is large enough to take care of sewage for a population of about 5,000 at 185 gallons per capita which is stated to be the maximum water consumption as taken from the records of the water department of the city. Since the present population of the sewer district is 2,500 a settling tank 37½ feet wide and as long as the one shown on plans, providing for a future population in the next ten years of about 3,000 persons, will allow for a 20 per cent. increase which is consistent with the growth of the city for the last fifteen years.

The filter beds consist of a unit of four beds four feet deep. Each bed is 132 feet wide by 144 feet long giving a total net area of 1¾ acres for the unit. Assuming that this type of filter can treat 400,000 gallons of settling tank effluent per acre per day, the unit is large enough to care for about 5,000 persons. Four beds 125 feet square forming a unit 250 feet square give an area of about 1.4 acres which is large enough to care for about 3,000 persons on the above assumptions.

In the case of disposal plants, which can be readily enlarged, it is not advisable to provide for more than a period of ten years in the future, both from the standpoint of economy and the uncertainty as to the future growth of the sewer district.

I, therefore, recommend that the department of public works be advised to arrange for the construction of a settling tank, preferably in two compartments having a total effective width of 37½ feet at present, providing, however, for future extension should the increase in population for the district necessitate such an enlargement. I also recommend that the department of public works be advised to construct the filter with four beds, each 125 feet square, with provisions for future enlargement and that the details of disposal works be submitted to this Department for approval before the work of construction begins.

I, therefore, recommend that a provisional permit be issued allowing the discharge of effluent from the sewage disposal plant into Hunter brook.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

PERMIT

Application having been duly made as provided by section 77 of the Public Health Law, as amended by chapter 468 of the Laws of 1903, permission is hereby given to the common council of the city of Auburn to discharge effluent from the sewage disposal plant to be constructed in connection with the sewer system for the first, sixth and tenth wards' sewer district into the waters of Hunter brook near the N. Y. C. & H. R. R. R. within the municipality of Auburn in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable or subject to modification or change at any time when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of Hunter brook or the unsatisfactory operation of the sewage disposal plant.
2. That both the sewer system and sewage disposal plant shall be constructed in full conformity with the plans approved by this Department.
3. That no storm or surface water from streets, roofs or other areas shall be admitted to the sewer system.
4. That before the construction of the sewer system and sewage disposal plant is commenced, detailed plans for such sewage disposal plant, in general accordance with the preliminary plans approved this day, shall be submitted to and be approved by this Department.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

February 26, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Cayuga county.

ALBANY, N. Y., *May* 1, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR: — I beg to submit the following report on an examination of plans for disposal works for the first, sixth and tenth wards' sewer district in the city of Auburn, Cayuga county, submitted to this Department for approval April 23, 1909.

The plans submitted consist of duplicate blue prints of the following:

1. Plan of reduction tanks and dosing chambers.
2. Details of reduction tanks and dosing chambers.
3. Plan and sections of contact beds.
4. Plan and details of grit chambers.
5. Plan and cross-sections of gatehouse.
6. Details of valves, water gates and sluice gates.

The submission of these plans is in conformity with the provision in the permit granted February 26, 1909, which states "That before the construction of the sewer system and sewage disposal plant is commenced, detail plans for such sewage disposal plant, in general accordance with the preliminary plans approved this day, shall be submitted to and be approved by this Department." The plans are also in general conformity with the suggestions and recommendations of the report dated February 26, 1909.

The reduction tank has two compartments and is large enough to treat the sewage from a population of about 4,000 persons at 185 gallons per capita and provides for about eight hours' detention. The contact beds are four in number, each 125 feet square with a depth of 4 feet, and will be required to treat the septic tank effluent at the rate of 500,000 gallons per acre under the above conditions. This rate is somewhat higher than is usual to allow for this method of supplementary treatment but will probably produce satisfactory results if properly constructed and carefully operated. Further, it may be some time before a population of 3,000 or 3,500 in the district is exceeded.

The operation of the disposal plant is briefly as follows:

The main outfall or collecting sewer is 24 inches in diameter and is divided into two branches which discharge into separate grit chambers each of which is provided with a coarse screen with a 1¼-inch clear space. From either one of the two grit chambers the sewage can be discharged into either of the two reduction tanks or into both compartments at the same time through submerged inlets; or the sewage can be by-passed through a 24-inch pipe laid inside and near the bottom of the three outside walls of the tanks. From the septic tank the effluent passes into a large dosing chamber having two compartments. From the dosing chambers the effluent is conveyed to a gatehouse through a 15-inch pipe laid in the wall of the dosing chamber and in the partition wall between the contact beds.

The distributing system and underdrains of the contact beds consist of pipes varying from five to fifteen inches in diameter. The effluent is to discharge into Hunter brook.

All valves and sluice gates of the disposal plant are to be operated by hand which should give very positive control of the entire plant.

While the controlling of the operations of the plant by hand-operated valves is likely to be just as effective or even more effective than such control by means of automatic devices, provided the necessary oversight together with constant attention are given to such a method of operation, it should be borne in mind that on account of the cost of the labor necessary this method of dosing and emptying contact filters is apt to be much more expensive, considering both fixed and operating changes, than a system of automatic control.

In view of the above I recommend that the plans be approved, the permit having been issued on February 26th.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

On July 12, 1909, application by the common council was received for the approval of plans for a proposed sanitary sewer in South Seward avenue. On July 27, 1909, these plans were approved and a conditional permit was issued allowing the discharge of sewage from the proposed sewer into Owasco outlet.

ALBANY, N. Y., *July* 19, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report on an examination of plans for a proposed sanitary sewer in South Seward avenue in the city of Auburn, Cayuga county, submitted to this Department for approval July 12, 1909.

The proposed 8-inch sewer, as shown upon the plans, is to be about 340 feet long and is to extend from Hockeborn avenue to Havens avenue. It is to connect with the Havens avenue sewer at the intersection of South Seward avenue and Havens avenue which discharges into the Owasco outlet through the Owasco street sewer at Lizette street.

It is stated in the letter from the city clerk submitting the plans that the city has recently completed a sewer system and disposal plant in the fourth, fifth, sixth and seventh wards' sewer district at a cost of $162,952, and that the city is going through the same work in the first, sixth and tenth wards' sewer district which will cost over $100,000.

In view of the above and of the comparatively small amount of additional pollution of the Owasco outlet that will result from the construction of this short sewer extension I recommend that the plans be approved and a permit issued allowing the discharge of sewage from the proposed sewer into the Owasco outlet.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

BATAVIA

On February 3, 1909, application was made by the board of sewer commissioners of the village of Batavia for the approval of plans for a complete sewer system and sewage disposal plant. These plans were approved on February 25, 1909, and a permit was issued allowing the discharge of the effluent of the sewage disposal plant to be constructed in connection with the proposed sewer system into Tonawanda creek.

ALBANY, N. Y. *February* 8, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report on an examination of plans for a complete sewer system and sewage disposal plant for the village of Batavia, Genesee county, which have been prepared by A. L. Webster and Rudolph Hering, consulting engineers, and Charles Hoopes, village engineer, and submitted to this Department for approval.

The plans comprise a report and specifications together with the following:

1. Tracing and black print of contour map of the village showing complete sewer system.
2. Tracing and black print of profiles of sewers.
3. Tracing and black print of pumping station and details.
4 Three blue prints of general plan of sewage disposal works.
5. Duplicate blue prints showing section through sewage disposal works.
6. Duplicate blue prints showing plan and section of septic tank.
7. Duplicate prints showing connection of New York State Institute for the Blind with proposed disposal works.

Batavia is located on the main line of the New York Central & Hudson River railroad about half way between Rochester and Buffalo, and had a population of 10,080 in 1905. Part of the village lies on the divide between Tonawanda creek, a tributary of the Niagara river, and Black creek, which flows into the Genesee river. The greater portion of the village area, however, drains into Tonawanda creek which flows through the southwestern section.

Most of the village is comparatively flat and level, and the fall of the creek is very slight, so that it is impossible to concentrate the sewage at one point and dispose of it into Tonawanda creek by gravity alone. This fact has been recognized in former studies of the sewer problem.

Plans for a complete sewer system and disposal plant, prepared by J. W. Holmes, were approved by this Department on March 8, 1895. These plans provided for a gravity sewer system which would carry the sewage to the eastward to a disposal plant on the banks of Black creek. The sewage treatment was to consist of broad irrigation and intermittent downward filtration. The proposition to construct this system was submitted to the taxpayers and defeated.

On August 9, 1902, plans for a change in location of the disposal plant were approved, the plan of the sewer system above referred to remaining the same. This disposal plant provided for septic tank treatment followed by sand filtration.

In 1905 plans for a complete sewer system and disposal plant were prepared by Alexander Potter and these plans were approved by the Department July 24, 1906. These plans divided the village into four drainage districts, each of which was provided with collecting sewers and a pumping station. All the sewage was to be pumped to the westward by Ellis pneumatic air lifts to a disposal plant located on the south side of Tonawanda creek beyond the village limits. The disposal plant provided for preliminary septic tank treatment followed by single contact beds.

The present plans provide for a complete sanitary sewer system which will also take care of the ground water so as to permanently lower the now high ground water table which is stated to be within three or four feet of the surface of the ground over a considerable portion of the village, and, at times of excessive rainfall, rises so as to flood cellars and basements. An allowance for inflow of about 50,000 gallons of ground water a day per mile of sewer has been provided for in the design of the system.

The sewers are found to be adequate as to size and capacity to meet any probable demand that may reasonably be made upon them for a considerable period in the future.

All the sewage is collected by gravity to a well at the central pumping station located near the intersection of Main and Ellicott streets, from which it is forced by centrifugal pumps through a 16-inch cast iron force main to a disposal plant near the northern limits of the village and west of the New York State Institute for the Blind.

The well is large enough to hold a maximum sewage flow for about three-fourths of an hour. It would, therefore, be advisable for the village authorities to provide for more than one kind of power in case of accident, and it is understood that such provision is to be made.

The force main has a capacity of 2,350 gallons per minute. An allowance in the design for 83⅓ gallons per capita for a future population of 22,500, together with 1,000,000 gallons inflow of ground water per day, has been made which amounts to 2,000 gallons per minute, showing that the force main is ample in size to handle the sewage on the above assumptions.

The method of purification proposed is preliminary septic tank treatment followed by sprinkling filters which should produce a satisfactory effluent since Tonawanda creek is not used for a water supply below Batavia. Should a purer effluent be required in the future, provisions have been made for a final settling basin.

The septic tank is built in two compartments 67 feet by 35.5 feet by 12 feet each, having a capacity of 200,000 gallons for each compartment which is adequate for the present population of 11,000, as it can be readily enlarged by adding more compartments.

The sprinkling filter shows a present area of two-thirds of an acre with possible future extension to one acre. The effluent from the filter is discharged by gravity into Tonawanda creek near Main street at the foot of Lyon street.

The sewer system and disposal plant seems to be comprehensive and, if properly operated, should furnish adequate sewerage facilities, as well as improve the sanitary conditions of the village by lowering the present high ground water level.

I, therefore, recommend that the plans be approved and a permit be issued under the usual conditions of revocation, allowing the discharge of the effluent into Tonawanda creek.

Since the present plan, if approved, will be the third plan for sewerage and sewage disposal for the village to be approved by this Department, I would recommend that a clause be included in the permit which shall provide that, if it is decided to construct the system under the present plans and if such construction shall be commenced by the village, it shall be considered that the two previous plans for sewerage and sewage disposal shall have been superseded and thereafter all sewer construction in Batavia shall be in conformity with the plans now before the Department.

Further, since only general plans for sewage disposal are submitted at this time, I would recommend that a clause be included in the permit which shall provide that before the construction of either the sewer system or the sewage disposal plant shall be commenced, detailed plans for the sewage disposal plant shall have been submitted to and approved by this Department.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

PERMIT

Application having been duly made as provided by section 76 of the Public Health Law, as amended by chapter 468 of the Laws of 1903, permission is hereby given to the board of sewer commissioners of the village of Batavia to discharge effluent from the sewage disposal plant to be constructed in connection with the proposed sewer system into the waters of the Tonawanda creek, at Lyon street, within the municipality of Batavia, in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable or subject to modification or change at any time when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the existing pollution of Tonawanda creek, or the unsatisfactory operation of the sewage disposal plant.
2. That before the construction of either the sewer system or the sewage disposal plant is commenced, detail plans of such sewage disposal plant shall have been submitted to and approved by this Department.
3. That both the sewer system and the sewage disposal plant shall be fully constructed in complete conformity with the approved plans and that no sewage shall be discharged into the sewerage system before the completion of the sewage disposal plant.
4. That no surface or storm water from streets, roofs or other areas shall be admitted to the sanitary sewer system.

EUGENE H. PORTER,
February 25, 1909. *State Commissioner of Health*

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Genesee county.

On December 21, 1909, plans were approved for a proposed change of alignment in the Hewitt Trunk sewer, so as to extend westerly in School street from the intersection of Hewitt place and School street extended to the intersection of this street extended to Jackson street, thence southerly on Jackson street to Ellicott street. There is no change in the size and grade of this sewer and the carrying capacity will remain the same as in the plans approved on February 25, 1909.

BATH

SOLDIERS AND SAILORS' HOME

On April 8, 1909, application was made by the State Architect in accordance with the provisions of section 14, chapter 45 of the Consolidated Laws (Public Health Law), for the approval of plans for the disposal of sewage from cottages at the Soldiers and Sailors' Home. After some correspondence plans were submitted July 26, 1909, in compliance with the rules and regulations of the Department and were approved on August 27, 1909. No permit was issued since only the approval of plans for a State institution is necessary.

ALBANY, N. Y., *August* 24, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report on an examination of plans for a proposed sewer and septic tank to serve three cottages connected with the New York State Soldiers and Sailors' Home at Bath and submitted to this Department for approval by the State Architect.

The sewage from the main building passes through a chemical precipitation plant and the effluent discharges into the Cohocton river. The cottages to be served by the proposed sewer and septic tank are located across the river from the present disposal plant and, therefore, cannot be connected with it without a great deal of expense.

The plans show that it is proposed to provide sewerage and sewage disposal for three cottages at present and that three more cottages are to be connected with the proposed septic tank in the future.

The proposed sewer is to be constructed of 6-inch tiles laid on a grade of 0.7 per cent. and should be adequate as to size and capacity if properly constructed. The septic tank is shown to be provided with a submerged inlet and outlet and is large enough to give eight hours' detention for the sewage contributed by twenty-eight persons at 100 gallons per capita per day which is the estimated future population for the six cottages to be cared for. The plans also show that it is proposed to discharge the effluent from the septic tank into the middle of the Cohocton river through a 4-inch cast-iron pipe.

In view of the above I recommend that the plans be approved.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

BEDFORD

STATE REFORMATORY FOR WOMEN

On June 29, 1909, plans for the proposed sewer system and sewage disposal plant for the New York State Reformatory for Women at Bedford were submitted to this Department for approval by the State Architect. On July 16, 1909, these plans were approved.

ALBANY, N. Y., *July* 16, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report on an examination of plans for the proposed sewer system and sewage disposal plant for the New York State Reformatory for Women at Bedford, Westchester county, submitted to this Department for approval by the State Architect June 29, 1909.

The institution is located on the Croton watershed from which New York city takes part of its water supply and it is stated that the present sewage disposal system consists of four tanks, a pumping plant and a system of subsoil drainage and that the ends of these subsoil drains often break out, allowing almost crude sewage to be discharged into a stream tributary to the Croton river. The report of the State Architect also states that the present population is 360 persons and that the ultimate population will not exceed 500. Also, that gaugings show the average flow of sewage to be about fifty gallons per capita per day.

It is proposed to install a new sewer system that will convey the sewage from all existing and proposed buildings, except three, to the new disposal plant. The sewage from two cottages and the administration building is to be pumped into the new gravity sewer system. The proposed sewers are adequate as to grades and capacities to meet any probable demand that may be made upon them.

The disposal plant consists of a screen chamber, septic tank, dosing chamber and sand filters. The septic tank is large enough to provide for about eight and one-half hours' detention of sewage at the rate of fifty gallons per capita per day for 500 persons.

The dosing chamber is provided with four plural alternating siphons which are intended to discharge doses sufficient to cover the filter beds to a depth of about one and one-half inches. The doses of septic tank effluent are to be distributed over the surface by means of wooden distributing troughs.

The filter beds are four in number, three feet deep, having a combined mean area of about 0.185 acres which provides for a rate of filtration of about 135,000 gallons per acre per day for the ultimate population of 500 persons. The system of underdrains is covered with 6-inches of course gravel above which the material. is graded as follows: Six inches of medium gravel, 6 inches of fine gravel, 12 inches of coarse sand with a top layer of medium sand, 6 inches thick, giving a total depth of 3 feet of filtering material.

The plans show that it is proposed to discharge the effluent from the sand filters into a small stream tributary to the Croton watershed.

The efficiency of the filter beds would be much increased if constructed with their three feet of depth composed of a greater depth of sand and a lesser depth of gravel. The depth of sand might be increased to two feet and the depth of gravel reduced to one foot — this depth of gravel giving sufficient assurance of proper underdrainage.

With this slight change in design, the plant should produce satisfactory results if properly constructed and operated, and I, therefore, recommend that the plans be approved with the condition that the filter beds be composed of two feet in depth of sand laid on gravel one foot in depth.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *July* 16, 1909.

HON. F. B. WARE, *State Architect, Capitol, Albany, N. Y.:*

DEAR SIR:— I am sending you herewith the approved plans for a new sewage disposal plant for the New York State Reformatory for Women at Bedford, Westchester county, and am inclosing a copy of the report of the Engineering Division on an examination of the plans.

In accordance with the recommendation contained in the inclosed report I have approved the plans on condition that a slight deviation from the plans submitted be made in constructing the filter beds so as to arrange for a depth of two feet of sand over one foot of gravel instead of one and one-half feet of sand and one and one-half feet of gravel as shown by the plans at present.

Very respectfully,
EUGENE H. PORTER,
Commission of Health

BINGHAMTON

During the past year plans for sewer extensions have been approved for the streets listed below. In each case permits allowing the discharge of sewage have been issued consistent with the policy of the Department requiring the separation of sanitary sewage from storm water in certain districts and in accordance with the conditions of a permit issued on March 29, 1907, published in Twenty-eighth (1907) Annual Report, page 34, which provide that before April 1, 1910, plans for a complete system of intercepting sanitary sewers and sewage treatment works for the collection and treatment of the sewage of the entire city at a site favorably located below the city shall be submitted by the city of Binghamton to the State Commissioner of Health for his approval.

Date.	Description of sewer.	Stream receiving sewage.
1909.		
March 27.	Extensions in Fourth ward	Susquehanna river.
April 1.	Reconstruction of Washington street sewer	Chenango river.
	Conklin avenue	Susquehanna river.
14.	College street	Chenango river.
26.	Birch street	Susquehanna river.
May 20.	Washington, Hamilton and Charlotte streets	Chenango river.
	Burr avenue	Susquehanna river.
27.	Prospect, Franklin, Valley, Front, Oak and Gaines streets	Chenango river.
June 21.	Hayden and Main streets	Chenango river.
Aug. 4.	Bedford, Kress, Grand and Second streets	Susquehanna river.
Oct. 6.	Moeller street	Chenango river.

BROWN STATION

MACARTHUR BROTHERS COMPANY AND WINSTON & COMPANY CONTRACTING CAMP

On April 25, 1909, application was made by MacArthur Brothers Company and Winston & Company for the approval of plans for a sewer system and disposal works for the camp established at Brown Station, Ulster county, but owing to the fact that the plan showed no grades and elevations, no details of construction, and operation of disposal works, and that plan was not submitted in duplicate, the Engineering Division could not proceed with the examination. MacArthur Brothers Company and Winston & Company were, therefore, asked to furnish additional plans and information, and the plans were returned. In accordance with this request amended plans were submitted for approval on February 4, 1909. These plans were approved on February 24, 1909, and a permit was issued allowing the discharge of the effluent of the broken stone filters into Esopus creek below the proposed Ashokan dam.

ALBANY, N. Y., *February* 17, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of the examination of plans for a sewer system and disposal works for the camp established at Brown Station, Ulster county, by MacArthur Brothers Company and Winston & Company in connection with the execution of their contract with the city of New York for the construction of the Ashokan dam and dike, the plans having been submitted by said contractors on February 4, 1909, for the approval of this Department.

The plans comprise duplicate blue prints showing plan of camp and complete sewer system, duplicate blue prints of profile of main sewer, duplicate blue prints showing plan and sections of disposal works and vaults together with a report.

Original map showing location of sewers and disposal plant was submitted April 25, 1908, but owing to the fact that the plan showed no grades and elevations, no details of construction, and operation of disposal works, and that plan was not submitted in duplicate, the Engineering Division could not proceed with the examination. MacArthur Brothers Company and Winston & Company were, therefore, asked to furnish additional plans and information, in a letter addressed to them May 4, 1908. As a result of the above request, additional plans showing the desired information and details of construction were submitted for approval February 4, 1909.

It is stated in the report that the camp and sewer system is built for the contractors' use while at work on the Ashokan reservoir, a period of seven years, and will be discontinued upon the completion of this contract. It is further stated that the total number of persons that are expected to be served by this sewer system is about 2,000.

The water supply for the camp consists of two tanks on the hill near the camp, one of 40,000 gallons capacity, with independent pipe lines for drinking water pumped from springs, and one of 200,000 gallons capacity, pumped from the river, for fire service and for flushing the sewer system.

The sewer system consists of about 18,000 feet of vitrified pipe, varying from eight inches to twelve inches in diameter and all but a comparatively small section is found to be adequate as to grades and capacities to meet any reasonable demand that may be made upon the system. The unsatisfactory section referred to consists of about 400 feet of an 8-inch sewer, having a minimum grade of .27 per cent. which is not ordinarily sufficient to produce self-cleansing velocities, but since this section has two vaults located above its invert which are flushed daily, besides having a manhole located at each end, it can be readily inspected and cleaned in case of clogging.

The disposal works consist of a settling tank and a broken stone filter bed. The settling tank is divided into two compartments, each provided with sludge drains, and has a capacity of 45,000 gallons, which provides for a 6-hour detention allowing 90-gallons per capita for 2,000 persons. The effluent from the settling tank flows through distributing troughs over the broken stone filter, which is 4 feet deep and has an area of about 0.12 acres. The final effluent is discharged into Esopus creek below the dam.

I, therefore, recommend that the plans be approved and a permit issued allowing the discharge of effluent from the disposal works into Esopus creek.

Very respectfully,

THEODORE HORTON,

Chief Engineer

PERMIT

Application having been duly made as provided by section 76 of the Public Health Law, as amended by chapter 468 of the Laws of 1903, permission is hereby given to MacArthur Brothers Company and Winston & Company to discharge effluent from the sewage disposal plant at Browns Station into the waters of the Esopus creek below the proposed Ashokan dam within the town of Olive in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of Esopus creek or the unsatisfactory operation of the sewage disposal plant.

2. That no storm water, surface water or other liquids than sanitary sewage shall be admitted to the sewer system and disposal plant.

3. That the plant shall be constructed in full conformity with the plans approved this day.

4. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge sewage or effluents from sewage disposal works into the waters of this State.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

February 24, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Ulster county.

CORNING

On November 30, 1908, application was made by the board of public works of the city of Corning for the approval of plans for an intercepting sewer, and providing for a comprehensive sanitary sewer system on the north side of the Chemung river, and for sewer extensions on the south side of the river. These plans were returned for correction and additional information on February 19, 1909. The amended plans were resubmitted for approval on March 2, 1909. On March 12, 1909, they were approved, and a permit allowing the discharge of sewage into the Chemung river was issued on the condition that plans for the collection and treatment of the entire sanitary sewage of the city of Corning be submitted for approval on or before February 1, 1910.

ALBANY, N. Y., *March* 4, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report of the examination of plans for sewer extensions in the city of Corning, Steuben county, recently submitted to this Department for approval.

The city of Corning is situated in Steuben county on the Chemung river below the confluence of the Canisteo and Cohocton rivers. The Chemung river flows through the city, dividing it into two drainage districts, one on the north side and the other on the south side of the river.

The records of the Department show that sewers were constructed in the city in 1888 without approval from this Department, and that the greater part of the system on the south side was constructed on the separate plan. On January 2, 1904, plans for a sewer system for the north side of the river having four outlets — two into the Chemung river and two into Post creek — were submitted for approval. Since these plans indicated that the sewers were intended for a combined system they were returned to the city together with a report recommending that further information concerning the north side sewer system be given; also, that the city authorities be requested to prepare and submit complete plans for sewage disposal works for both the north and south side sewer districts, pointing out the inadvisability of constructing sewers on the combined plan in view of the large expense that would have to be incurred in rebuilding the system when separation and disposal is ultimately required, which requirement was then an imminent necessity owing to the highly polluted condition of the Chemung river. The report also pointed out the advisability of concentrating the sewage at one or two points for economical treatment.

In reply to the above requests Mr. F. D. Kingsbury, president of the board of sewer commissioners of Corning, stated that the outlet about to be constructed was for storm water purposes exclusively, and that no sewage of any description would be carried by it, and further that the sewer commission proposed separation by providing an independent discharge of the storm water into the Chemung river; whereupon Mr. Kingsbury was notified that no permit would be necessary for the discharge of storm water. Part of this system is, however, being used as a combined system and the plans recently submitted for approval provide for the interception of the sanitary sewage from this combined system on the north side at Baker street.

The plans now under consideration were submitted to this Department for approval November 30, 1908, and were returned for correction and additional information February 19, 1909. The amended plans were resubmitted for approval March 2, 1909. These plans provide for minor extensions on the south side and a comprehensive sanitary sewer system on the north side of the river intercepting the domestic sewage from the existing combined system at Baker street through a 24-inch main outfall sewer to discharge into the Chemung river below the mouth of Post creek. This is a progressive step both inasmuch as it will tend to abate the nuisance now created by the discharge of sewage into Post creek during dry seasons and since concentration will be effected to the extent that one outlet for sanitary sewage is proposed in place of four as previously contemplated. The sewers are found to be adequate as to grades and capacities to satisfactorily meet any probable demand that may be made upon them for a considerable period in the future.

A sanitary inspection of the entire Susquehanna river watershed within the limits of the State of New York was made by this Department in the year 1907. This inspection included a statistical investigation with regard to the population residing upon the drainage area of the Chemung river and its main tributaries in both the State of New York and Pennsylvania; the population which contributes raw sewage to the river and its tributaries in the State of New York; and the principal sources of pollution of the river and its tributaries from manufacturing or industrial sewage in the State of New York.

The drainage area of the Chemung watershed at Corning is 2,040 square miles having a population of about 101,000. This gives a resident population of about 50 per square mile.

While a large majority of the population residing on the Chemung river basin does not discharge sewage directly into the streams but are provided with vaults, cesspools and other means of disposal of sewage, whereby the sewage is practically purified by percolating through the soil, a large portion of the population does, however, discharge its sewage directly into these waters by means of sewer systems, private drains or by privy vaults and cesspools located directly on the banks or over the streams.

The estimated population that discharges sewage directly into and thus contaminates directly the stream just below Corning is 18,035, of which Corning contributes about 5,500.

The volume of flow of the Chemung river is extremely variable; the flood flows sometimes amounting to several hundred times the dry weather flow. There are periods when the mean dry weather flow is only 208 cubic feet per second for a period of one month, and 103 cubic feet for a period of one week. This low mean weekly dry weather flow gives 8.3 cubic feet per second per 1,000 population directly polluting the stream just above Corning and 5.7 cubic feet per second flow per 1,000 population directly polluting the stream after allowance is made for the 5,500 persons discharging raw sewage from Corning.

The above data show that the additional pollution of the Chemung river by Corning alone is enough to produce a local nuisance at times of low water as well as making the river a dangerous source of water supply for municipalities located below the city. This danger is constantly increasing owing to the concentration of the population in cities and the increased sewerage facilities being furnished.

The Chemung river is the chief source of water supply for the city of Elmira located about eighteen miles below Corning. The water supply for Elmira taken from the Chemung river is passed through a mechanical filter plant. Filtration, however, does not afford complete protection even when filter plants are being operated at their maximum efficiency and there is always a residual pollution which is not removed somewhat proportional to the degree of pollution existing before filtration. The typhoid fever death rate of Elmira, therefore, accounts in part for the extent of pollution of the Chemung river.

In Pennsylvania many municipalities derive their water supply from the Susquehanna. Many of them do not employ filtration among which may be mentioned Towanda, Tunkhannock and Steelton. The Spring Brook Water Supply Company of Wilkesbarre supplies ten municipalities, having a combined population of over 100,000, from the Susquehanna during certain dry seasons of the year without employing filtration.

In order to abate the serious condition of pollution of the Susquehanna and its tributaries and protect the water supplies, the river should be protected from pollution and restored to as pure a condition as is practicably possible. This can only be done by requesting such municipalities as Corning to make some definite provisions for purification of their sewage — provisions similar to and consistent with those which you have required in the case of the cities of Hornell, Elmira and Binghamton.

In view of the fact that the city of Corning has constructed its sewer system principally on the separate plan and has already made gratifying progress toward separation and concentration of sewage preliminary to disposal, I believe that one year should be ample time within which the city should be required to design and submit plans for sewage disposal works.

I, therefore, recommend that the plans be approved and a permit issued embodying a requirement for the submission within a specified time of plans for works to treat the entire sewage of the city with the further provision that any or all portions of such disposal works shall be constructed at such time as may be deemed advisable in the opinion of the State Commission of Health.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

PERMIT

Application having been duly made as provided by section 77 of chapter 49 of the Laws of 1909, constituting chapter 45 of the

Consolidated Laws, permission is hereby given to the board of public works of the city of Corning to discharge sewage from the proposed sanitary sewer system north of the Chemung river and from lateral sanitary sewers on the south side of the river into the waters of the Chemung river near the mouth of Post creek and near Denison park within the municipality of Corning in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when, in the judgment of the State Commissioner of Health, such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of the Chemung river.

2. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage into the waters of this State.

3. That on or before February 1, 1910, plans satisfactory to this Department for complete sewage disposal works to treat the entire sanitary sewage of the city of Corning, accompanied by a proper application for the approval thereof, shall be submitted to this Department for approval together with plans for such intercepting and outfall sewers as may be necessary to convey the sanitary sewage of the city to the site or sites selected for such sewage disposal works.

4. That whenever in the opinion of the State Commissioner of Health, it is deemed necessary or desirable, any designated portion or all of said sewage disposal works shall be constructed within such time limit as may be then specified.

ALEC H. SEYMOUR,

Acting State Commissioner of Health

March 12, 1909.

[NOTE.— This permit to become operative must first be recorded in the county clerk's office of Steuben county.

DEPEW

On January 21, 1909, application was received from the president and board of trustees of the village of Depew for the approval of plans for sewer extensions on the south side of Broadway. These plans were approved on January 25, 1910, and a permit was issued allowing the discharge into Cayuga creek of the sewage from the proposed sewers after treatment in the sewage disposal plant.

ALBANY, N. Y., *January* 25, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR: — I beg to submit the following report of the examination of plans for sanitary sewer extensions for the village of Depew, Erie county, recently submitted to this Department for approval.

The plans comprise tracings and blue prints of plan and profile of sewer extension on the south side of Broadway, together with a report by Mr. M. H. Catchell, designing engineer.

The plans for a complete sewerage system and disposal plant were approved by the Department June 30, 1896. A comprehensive report of the sewer system is contained in the Seventeenth Annual Report of the State Board of Health. The plans for the disposal plant, built and now in operation serving about one-half of the entire population, were approved September 5, 1900. A complete report of the same is found in the 1900 report of the State Board of Health.

The proposed extension consists of about 4,000 feet of 8-inch sanitary sewers to be located on the south side of Broadway from St. Mary's street to Bryant street. The purpose of the proposed sewer is to enable the residents on the south side of the street to connect their houses without being obliged to excavate trenches across the street to connect with the present low level 15-inch trunk sewer located on the north side of Broadway and also to care for sewage from lateral streets running south from Broadway for a distance of 300 feet.

The proposed sewer and the existing 15-inch trunk sewer are connected at four different points. At two of the points, where the connections come into the manholes of the trunk sewer at an elevation of more than two feet above their inverts, drop manholes are to be used.

The plans are found to be satisfactory and the extensions adequate as to capacity to meet any probable demand that may be made upon them.

I, therefore, recommend that the plans be approved and that a permit be issued to allow the discharge of sewage into the present 15-inch trunk sewer which connects with the disposal plant, the effluent of which is discharged into Cayuga creek.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

PERMIT

Application having been duly made as provided by section 76 of the Public Health Law, as amended by chapter 468 of the Laws of 1903, permission is hereby given to the board of trustees of the village of Depew to discharge sewage from the proposed sewers on the south side of Broadway into the waters of Cayuga creek at the point of discharge of effluent from the sewage disposal plant near Borden road within the municipality of Depew, in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable or subject to modification or change at any time when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the existing pollution of Cayuga creek or the unsatisfactory operation of the sewage disposal plant.
2. That all the sewage to be collected by the proposed sewers shall be passed through the sewage disposal plant constructed by the village of Depew under plans approved by this Department on September 5, 1900.

3. That no storm or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

January 25, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Erie county.

DOLGEVILLE

On July 27, 1909, application was made by the board of sewer commissioners of the village of Dolgeville for the approval of plans for sewer extensions in Helmer avenue and Green street. These plans were approved on August 18, 1909, and a permit allowing the discharge of sewage after treatment in a septic tank into East Canada creek was issued subject to the satisfactory operation of the sewage disposal plant.

ALBANY, N. Y., *August* 13, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— In the matter of the application from the board of sewer commissioners in the village of Dolgeville for the approval of plans for sewer extensions on Helmer avenue and Green street, submitted on July 27th, I beg to state that the sewers proposed comprise short extensions to the present approved plan for sewerage in the village of Dolgeville and are tributary to the sewage disposal plant now in operation.

The sewers proposed are fairly well designed in respect to grades and capacities and are likely to meet any demands for capacity in the future.

The sizes of the proposed sewers are shown to be six inches and the grades of the two upper sections are 0.60 per cent. It is suggested that either the size of this section of the sewer should be increased to eight inches or the grade somewhat increased though I would recommend the approval of the plans as presented, calling attention to this desirable increase in size or grade in order to maintain a self-cleansing velocity in this section of the sewer.

I would, therefore, recommend that the plans be approved and a permit issued. Respectfully submitted,

THEODORE HORTON,
Chief Engineer

PERMIT

Application having been duly made to the State Commissioner of Health, as provided by section 77 of the Public Health Law, chapter 49 of the Laws of 1909, constituting chapter 45 of the Consolidated Laws, permission is hereby given to board of sewer commissioners in village of Dolgeville to discharge sewage from the proposed sewer extensions in Helmer avenue and Green street into the waters of East Canada creek through the outlet of the sewage disposal plant within the municipality of Dolgeville, in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when, in the judgment of the State Commissioner of Health, such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of East Canada creek or the unsatisfactory operation of the sewage disposal plant.
2. That all sewage to be collected by the proposed sewers shall be passed through the sewage disposal plant of the village of Dolgeville.
3. That the granting of this permit shall not be deemed to affect in any way the action of this Department on any future application that may be made for permission to discharge sewage or any effluent into the waters of this State.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

August 18, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Herkimer county.

EAST ROCHESTER

On April 12, 1909, application was made by the board of trustees of the village of East Rochester to amend plans for sewers in Garfield and Madison streets as shown in the plans for a complete sewer system approved by the Department on August 7, 1908. (See twenty-ninth [1908] Annual Report, pp. 19–26). On April 14, 1909, the proposed change for construction of the above sewers was approved.

EAST SYRACUSE

On February 19, 1908, application was made by the board of sewer commissioners of the village of East Syracuse for the approval of plans for an overflow for the village sewer system into Headson creek. On March 7, 1908, one of the engineers of the Department was sent to East Syracuse to consult with the village authorities and their engineer. At a meeting of the sewer commissioners all available data was secured as to the construction and operation of the system and a careful field inspection was made to determine existing conditions. Subsequent to this inspection a report was prepared stating the existing conditions, discussing the problems of the situation and their solution, and recommending that further action on the plans be deferred until the village sewer commissioners had considered the conclusions and recommendations of this report. A copy of this report was transmitted to the village sewer commission on April 10, 1908, together with a letter offering to arrange for one of the engineers of this Department to meet the commission and explain and discuss with them further the matters in the report.

As a result of action based upon this report, the village had their engineer revise the plans so as to remodel the village sewer system in such a manner as to conform to the plan outlined in the report above referred to. The revised plans were submitted to the Department under date of January 7, 1909. On February 18, 1909, they were approved and a permit was issued allowing the discharge of the effluent of the proposed sedimentation basin into Marcey creek.

ALBANY, N. Y., *April* 9, 1908.

EUGENE H. PORTER, M. D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to report herewith on the design, construction and operation of the sewerage system of the village of East Syracuse, Onondaga county. This report is submitted in connection with the application of the sewer commissioners of the village for a permit to construct an outlet sewer into Headson creek, received by the Department, February 19, 1908.

One of the engineers of the Department was sent to East Syracuse on March 7th to consult with the village authorities and their engineer. At a meeting of the sewer commissioners all available data was secured as to the construction and operation of the system and a careful field inspection was made to determine the existing conditions.

The village of East Syracuse is located in the east central part of Onondaga county, about four miles east of the city of Syracuse. The village lies betwen two streams, Butternut creek which is about a mile and a half to the east of the village, and Headson creek which is about a half mile to the west of the village.

Butternut creek flows north and east, is met by Limestone creek and finally flows into Chittenango creek, which empties into Oneida lake. This creek is used as a feeder to the Erie canal and it has been estimated by the late Mr. George Rafter that its minimum flow might be as low as three cubic feet per second. The average flow of this stream is, however, much greater than the above and gaugings in August have determined it as thirty cubic feet per second.

Headson creek has its head at the embankment of the Erie canal and gets its supply from leakage from the canal and the flats through which it flows. Its average flow during the canal season is estimated at about two and one-half cubic feet per second. At the time of inspection it was estimated that there was a flow of about five second feet. Headson creek flows north and west to Ley creek which has its outlet in Onondaga lake.

That part of the village south of the New York Central freight tracks lies on a low flat that extends to the Erie canal. The northern part, however, is at a higher level and has a rolling topography with natural drainage to Headson creek on the west and to Butternut creek on the east. In several different parts of the village the rock substrata has yielded flowing water when tapped by driven wells, and some of these wells are still in use.

The population of East Syracuse is estimated at about 3,000 for 1908. The census reports give the following figures: for 1890, 2,231; 1900, 2,509; 1902, 2,857; 1905, 2,996.

The village takes its water supply from springs to the southwest of the corporation. No definite data as to the consumption per capita is available. The public supply is used by the large majority of the population, and the village authorities state that the large number of water power washing machines increase the normal flow of sewage by a considerable amount on the first days of the week. As to the present flow, there are 186 connections with the sewer system, representing, say, a thousand people.

The original plans for a sewer system for the village of East Syracuse were approved by this Department in December, 1900. These plans stipulated pumping the sewage to Butternut creek. Construction was delayed, however, and in 1902 the question of using a gravity system and outlet into Headson creek instead of pumping into Butternut creek was raised by the village authorities. An exhaustive report was submitted to the village by the late Mr. George Rafter in 1902, stating the relative merits of the case.

In November, 1904, plans for a disposal plant using a septic tank and contact filters were approved by this Department. These plans required that the sewage be pumped up about 48 feet to the disposal plant located about one and one-half miles east of the town, the effluent being discharged into Butternut creek.

The existing system may be briefly described as follows:

The sewage of the northwest part of the village is drained to the intersection of Terrace and Highland avenues. The remainder of the northern part is drained east to Hartwell avenue, excepting Irving and Hemmens streets, where the sewers are continued through to Dawsman street and back to Hartwell avenue by way of Ellis street. The latter sewers are laid in a deep cut of about 17 feet and a drop manhole is required at Ellis and Hartwell streets. Sewage from the north side is then carried across the

N. Y. C. tracks at Hartwell avenue and at Highland avenue, the former being conveyed directly to the receiving well on Henry street, the latter running on Clark street and Second street to the Henry street receiving well. As the Second street sewers run contrary to the natural slope of the ground, a deep cut of from 13 to 17 feet results in the greater part of its length.

The pump station is located by the receiving well on Henry street and Second street. The apparatus consists of an 8-inch vertical centrifugal Van Wie pump driven by a General Electric 20 H. P. induction motor. The force main is of 8-inch cast-iron pipe, and has two outlets, one at Butternut creek at a distance of about 5,200 feet and one at the grit chamber or septic tank which is about 8,200 feet distant from the pumping station. The force main has several 90 degrees angles in it.

The disposal plant is located about 3,000 feet to the east of Butternut creek and a few hundred feet north of East Manlius street. The septic tank has a capacity of 75,000 gallons, and is equipped with a dosing chamber in which are placed the automatic siphon apparatus which discharges the effluent of the tank onto the filter beds. There are 4 contact beds, each having a net area of 0.09 acres. The effluent of the plant is then discharged into Butternut creek.

Laying of the sewers was started in the spring of 1904, and the system was not completed till 1906. The pumping plant was installed in June, 1906, and the disposal plant was accepted in the spring of 1907. The total outlay was about $80,000.

In the process of construction much ground water was met with. In the region of Ellis and Hartwell streets, in the deep cut a supply of water under pressure was tapped, and it became necessary to substitute cast iron for vitrified pipe. The construction of the drop manhole at this point was attended with many difficulties arising from the rapid flooding and high pressure of the water met with. On Second avenue the ground water was very troublesome. One of the flowing wells referred to is located at Second and Bridge streets. The supply of this well is effected by pumping out the sewers and its flow has been entirely stopped when the sewers were operating freely and were not backed up.

On June 25, 1906, the pump was started and has operated almost continuously till May 24, 1907. At first it was required only to pump intermittently, but as the ground water accumulated in the fall, it became necessary to pump three-fourths or all of the time. The total amount paid for electric power for this period of 11 months is about $3,100, and, adding the salaries of two men employed at the station, the expense of maintenance of the pumping station for 11 months becomes about $4,300. It must be remembered that the pumping done in this period lifted the sewage to the creek only, a 15 feet lift, while pumping to the disposal plant involves a lift of about 46 feet.

For the first three months the results were quite satisfactory and the cost was about $250 a month. At times, however, during these 11 months the sewer manholes have been flooded to a depth of 6 feet or more and in spite of continuous pumping no gain could be made against the water filtering into the system for weeks at a time. Under the latter conditions, the expenses of pumping have been as high as $500 a month.

The pump was designed to deliver about 500 gallons a minute. Tests have shown its capacity as 500, 316, and several later tests agree at about 170 gallons per minute. As near as can be ascertained the motor has been running at least at its full capacity of 20 H. P.

From the above statements, it is clear that the existing cost of maintenance and unsatisfactory operation of the system is due in the first place to the large amount of infiltration of ground water that must be handled by the pumping plant. This amount of ground water was not anticipated by the engineers and consequently the disadvantage of deep cuts under the existing conditions of ground water could not be foreseen.

Again the pumping plant has not been installed in accordance with the plans submitted. It was intended to erect a duplicate pumping plant, but only one pump and motor were installed. A duplicate system would have provided for a break down in the pump which has luckily not occurred and at the same time, the alternate use of one pump and then the other would have undoubtedly secured for each pump a higher efficiency than is now being obtained.

It is evident that the large expense of operating the system due to this infiltration, the inadequacy of the pumping plant, together with the high lift and the very considerable friction head involved, has become excessive for a village of the size of East Syracuse. And further it is apparent that a careful study of the problem is required to determine the means to economically and effectually relieve the situation.

Any plan which will effectually solve the existing problem met with in East Syracuse must, in the first place, eliminate the infiltration insofar as it is possible; and in the second place provide an economical means of caring for that infiltration which will still occur at certain times of the year at least.

It is essential, then, that the infiltration which at least doubles the flow of sewage be eliminated. To this end a careful inspection of the flow of sewage in the critical manholes was made by our engineer and the general location of the area where infiltration occurs was determined. The high level sewers seemed to carry little over a normal flow and the conclusions already suggested by the data obtained in construction were ratified, namely, that the large percentage of infiltration occurs in the region east of Hartwell avenue and along Second street.

The superintendent of sewers stated that in this region east of Hartwell avenue there are at present not more than three connections to the sewer system. Under these conditions it seems feasible to cut off this section east of Hartwell avenue by constructing a high level intercepter, starting at the manhole on Irving and McCool streets, and running thence on Irving street to Hartwell avenue, south on Hartwell avenue to Manlius street and across the railroad tracks to Second street. This intercepter would thus collect all the sewage flowing east toward Hartwell avenue, and deliver it at Second street at an elevation of about 44 feet.

From this elevation of approximately 44 feet, it now becomes possible to continue the sewer west on Second street with a shallow cut, reaching Second and Burrows streets at an elevation of about 41 feet. And to complete a gravity system for the village, it is necessary only to continue north from Burrows street, intercept the sewage from the northwest section of the village at Clark street or Highland avenue, and discharge the sewage into a settling tank suitably located, the effluent from which may be emptied into Headson creek. This outfall sewer from the settling basin would discharge into the creek at an elevation of about 36 feet, which requires that its outlet be at a point near West Manlius street crossing.

This plan, then, by construction of an intercepting sewer at a higher level and a sewer in shallow cut on Second street, would undoubtedly eliminate a large percentage of their infiltration now occurring. It also provides a gravity system which will, without the expense of pumping, convey the sewage and any infiltration that may still occur to a point of disposal. It is also possible to construct, for the time being, only part of the total length of sewer involved in the complete plan outlined above, and yet relieve the existing situation. By building the settling tank and a part of the proposed sewer, starting at Burrows street, at an elevation of about 41 feet, and continuing to its point of discharge into Headson creek, a gravity outlet is obtained for an immediate relief, and at the same time a large part of the work involved in the plan outlined above is thus completed.

In the future the remainder of the proposed gravity sewer — that on Second street and Hartwell avenue — may be constructed.

This latter construction will eliminate much ground water, and will greatly reduce the cost of the additional purification of the sewage that may be required at Headson creek.

In summary of the above, I, therefore, beg to conclude:

(1) That a careful study of the system as built and of the conditions that exist which interfere with the successful operation of the system has brought out the necessity of a radical rearrangement of the plant.

(2) That after a consideration of various expedients, a gravity system with disposal into Headson creek is considered the most effective and economical solution of the problems involved.

(3) That an immediate relief from existing conditions may be obtained with less than half the total expenditure involved in the above plan, or say $6,000, by construction of the outfall sewer from Burrows street to the point of discharge into Headson creek; thus leaving the remaining construction for a future time when additional funds may be more readily secured.

And, further, I beg to recommend that the sewer commissioners of the village of East Syracuse take up the preparation of plans along the lines suggested above, or others equally efficient, and that they present these plans at an early date to this Department for approval.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *February* 17, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— In the matter of plans for remodeling and extensions of the sewage system for the village of East Syracuse, which have been before the Department for approval and in regard to which a report was submitted to you under date of April 9, 1908, I beg to report further as follows:

In my report to you of April 9, 1908, a review of the unsatisfactory conditions of construction and operation of the present system was clearly pointed out, and, as a result of careful investigation and study, a plan was suggested for remodeling and improving the present system so that it would operate satisfactorily. This report was transmitted to the village authorities and as a result of action based upon this report, the village had their engineer design a system involving a remodeling of it in such a manner as to conform to the plan outlined in the report of April 9th referred to.

These plans were submitted to the Department under date of January 7, 1909, and have been carefully examined by the Engineering Division, which investigation shows that the design has been carried out in substantial accordance with the recommendations in my report of April 9th referred to, and for this reason I recommend that the plans be approved under certain conditions referred to hereafter. Attention should be called, however, to the fact that the method of arrangement for sewage purification provided by the plans involves a change in the regimen of flow of Headson creek in that it involves a deepening of the channel of this brook below the proposed location of the sewage disposal works. Such artificial changes in a natural waterway are always attended by certain risks in regard to hydraulic considerations, more particularly to the possibility of subsequent silting up of a deepened channel due to the change in hydraulic grade and the resultant changes in velocity of flow, these reduced velocities of flow resulting frequently in a deposition of suspended matters and a gradual silting up of the channel. I believe, however, that, if this point is carefully taken into consideration in the deepening of this channel and if proper and occasional work of cleaning is applied to it, any such trouble will be reduced to a minimum.

It is stated in the application that permission is requested for the temporary use of a septic tank at an intermediate point along the outfall sewer as shown upon the plans, by which is inferred a desire to postpone the installation of the complete plant until such time as in your opinion it may be considered necessary. This request is based upon the grounds of expense, and I believe the conditions of flow in Headson creek and the proposal to provide a temporary septic tank might meet the reasonable temporary requirements for disposal for a limited time in the future.

In the report of Mr. Smalley, engineer for the village, dated January 15th, he states that he has shown on the plans the temporary septic tank near the freight branch of the New York Central & Hudson River railroad, to be built similarly to the temporary tank now in use except that its size shall be that shown upon the plans for the disposal works herewith presented. A temporary tank of this size has been found after careful computation to be suitable for the requirements of the village, considered as a septic tank only and not as complete works. I believe, therefore, that it would be reasonable to permit the village to construct and use such a temporary tank for a reasonable time in the future or until the conditions are such as to demand more complete purification.

In view of the foregoing, I, therefore, recommend that the plans be approved and that a permit be issued to the village allowing them to omit temporarily the complete and final works shown upon the plans and to provide in its place a temporary septic tank of the size and arrangement of the septic tank shown for the complete works upon the plans now submitted, upon condition that this temporary tank shall be abandoned and new disposal works constructed in accordance with the plans herewith submitted at such time and date as you may decide upon and so notify the village.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

PERMIT

Application having been duly made as provided by section 76 of the Public Health Law, as amended by chapter 468 of the Laws of 1903, permission is hereby given to the board of sewer commissioners of the village of East Syracuse to temporarily discharge effluent from the proposed sedimentation basin near the freight branch of the N. Y. C. & H. R. railroad into the waters of Marcey creek at the railroad culvert within the municipality of East Syracuse in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable or subject to modification or change at any time when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the unsatisfactory operation of the sedimentation basin or the existing pollution of Marcey creek.

2. That the temporary sedimentation basin to be constructed at the point shown on the plans shall have inside dimensions of 60 feet by 26 feet, with an effective depth of 6 feet, and shall be similar in construction to the sedimentation basin shown on the plans approved this day.

3. That this permit shall terminate on March 1, 1914, at which time the complete, permanent sewage disposal works as shown by plans approved this day shall have been constructed and put in operation.

ALEC H. SEYMOUR,

Acting State Commissioner of Health

February 18, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Onondaga county.

ELMIRA

On February 17, 1909, plans were approved for sewer extensions in the city of Elmira, and a permit allowing the discharge of sewage into the Chemung river was issued, containing the provision that on or before March 1, 1910, comprehensive plans should be submitted this Department for the interception and treatment of the entire sanitary sewage of the city.

ALBANY, N. Y., *February* 16, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to report herewith upon my examination of plans for sewer extensions in the city of Elmira which were submitted for approval under date of November 24, 1908.

The examination of these plans has been delayed owing to important questions which have arisen in relation to the pollution of the Chemung river and its tributaries and the associated question of sewage disposal in connection with those municipalities which have been and are still discharging raw sewage into these waters. Delay has also been occasioned by the failure to receive certain reports and information from the State Department of Health of Pennsylvania who are vitally interested in this same question and with whom a policy of co-operation with respect to the Susquehanna basin has been understood and is being followed out by you in order to conserve the purity of its waters.

The list of extensions included in this application comprises some 10,000 feet of sewers ranging from 15 inches to 18 inches in diameter and is as follows:

West Gray street — Randall to Foster avenue.
West Water street — Randall to Foster avenue.
Canal street — Extension to Washington street.
Magee street — Fourth to Clinton street.
Magee street — Clinton to Third street.
Magee street — Third street south to an alley.
Grove street — North of Logan to Clinton street.
Grove street — Third to Second street,

Grove street — Clinton to Third street.
Franklin street — West of Pine to South Broadway.
Logan street — Grove to Walnut street.
Sullivan street — Pattinson to Washington avenue.
Sullivan street — Church to Market street.
Sullivan street — Market to John street.
Lincoln street — Extension north to Welles street.
East Miller street — Lake terrace to Spaulding street.
Grand Central avenue — Division to Maxwell place.
Pattinson street — Oak to Sullivan street.
Pratt street — Carpenter to Pattinson street.
Linden place — Pratt to Sullivan street.

All of these sewer extensions, except two on West Gray and West Water streets, respectively, are situated within the limits of the district bounded by Hoffman street, Roe avenue, Thurston street and Newton creek, within which boundary only it is your intention to approve under certain conditions combined sewers. The two sewers referred to, however, are merely proposed extensions of sewers outside of the limits of this district. Permits have, however, been previously granted by you in these cases, and for this reason I see no reason for not recommending approval of the further slight extensions. The sizes, grades and capacities of the various extensions seem to be adequate to remove the sewage of the territory which they serve, although no attempt has been made to pass upon the adequacy of these sewers as storm water carriers under present or future conditions of concentration and run-off.

In regard to the question of sewage disposal, I am of the opinion that the time has now come when some definite measures should be taken to provide for purification of the city's sewage. The importance of such provisions has very forcibly brought to light during recent years and especially as a result of the special investigation which you have had carried out by this Division during the past two years. The Chemung river is subject to extreme variation of flow and the pollution resulting from the discharge of sewage from Hornell, Corning and Elmira into this river has caused serious insanitary and dangerous conditions along its entire course.

I beg, therefore, to recommend that in any approval which you may give to these sewer extensions you include some definite provisions as to immediate or ultimate purification of sewage of the entire city — provisions similar to and consistent with those which you have required and are having effectively carried out in the case of the cities of Hornell and Binghamton. I would suggest that, owing to the fact that Elmira has not had to face this proposition in the past and in order that no embarrassment be occasioned by your refusal to approve the present extensions, that the city be required only to submit, now or within a reasonable time, the necessary plans for intercepting and outfall sewers and disposal works by which the sanitary sewage of the city can be properly collected and conveyed to a suitable point below the city and there treated in suitable purification works.

I believe that one year should be ample time within which the city should be required to design such intercepting sewers and disposal works, and, since the plans for the present sewer extensions are satisfactory, I beg to recommend your approval of them and the issuance of a permit embodying the above provisions as to submission of plans for sewage disposal and the further provision that any or all portions of said purification works shall be constructed at such time as the conditions of pollution of the river, or other reasons, shall in your opinion make it necessary.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

PERMIT

Application having been duly made as provided by section 76 of the Public Health Law, as amended by chapter 468 of the Laws of 1903, permission is hereby given to the board of public works of the city of Elmira to discharge sewage and storm water from the sewers named on sheet attached into the waters of the Chemung river through the existing sewer outlets within the municipality of Elmira in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to change or modification when, in the judgment of the State Commissioner of Health, such revocation, modification or change shall become necessary or desirable by reason of the existing pollution of the Chemung river.

2. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application which may be made for permission to discharge additional sewage into the waters of this State.

3. That on or before March 1, 1910, plans satisfactory to this Department for complete sewage disposal works to treat the entire sanitary sewage of the city of Elmira, accompanied by a proper application for the approval thereof, shall be submitted to this Department for approval, together with plans for such intercepting and outfall sewers as may be necessary to convey the sanitary sewage of the city to the said disposal works.

4. That, whenever in the opinion of the State Commissioner of Health, it is deemed necessary or desirable, any designated portion or all of said sewage disposal works shall be constructed within such time limit as may be then specified.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

February 17, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Chemung county.

FORT EDWARD

On September 21, 1908, application was made by the board of trustees of the village of Fort Edward for the approval of plans for repairs to the existing sewer system. On September 29, 1908 (see Twenty-ninth [1908] Annual Report, p. 161), this application was denied, since the construction of the sewers shown in these plans did not comply with the plans for the new system approved by this Department on September 17, 1907 (see Twenty-eighth [1907] Annual Report, pp. 44–52), and involved not only repairs to the existing combined sewer system, but reconstruction and enlargement of this system, thus tending to delay the construction of the sewer system as approved by this Department and the installation of the proposed sewage disposal plant.

On December 27, 1908, the village attorney and chairman of the sewer committee submitted a brief asking for a reconsideration of the Commissioner's decision on the ground that the village had only $20,000 at their disposal, enough to make the desired repairs, while the construction of the system approved in 1907 would cost about $100,000. This was followed by a conference at the Department on January 7, 1909, at which representatives of the village were present, and after which the plans were referred to the Engineering Division for re-examination and for a supplementary report as to conditions under which the plans for repairs would be approved. This report was submitted by the Chief Engineer on January 11, 1909, and proposed two alternate propositions to be adopted by the village in order to secure the approval of the above plans: (1) To construct two main intercepting sewers and a portion of the disposal works which are parts of the system approved by the Department in 1907, these main sewers to be extended so far as it would be necessary to intercept the two sewers under consideration; (2) to treat the dry weather flow in tanks, one on each of the two outlets located on Brown's lane and discharging into the Hudson river, and 100 feet east of Rogers street extended and discharging into Bond creek, respectively.

A copy of this report was sent on January 13, 1909, to the village authorities with a letter advising the adoption of the first plan. Further correspondence and interviews with the village representatives followed. On February 12, 1909, plans were resubmitted which were in conformity with the second of the alternate temporary plans outlined in the report under date of January 11, 1909. These plans were approved on February 17, 1909, and a permit allowing the temporary discharge of sewage into the Hudson river and Bond creek was issued subject to the condition that all sewers hereafter constructed in the village of Fort Edward shall conform to the plan for sewerage approved by this Department on September 17, 1907.

ALBANY, N. Y., *January* 11, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— In the matter of plans for repairs to the existing sewer system of the village of Fort Edward, which were submitted to the Department for approval on September 21, 1908, I beg to submit the following additional or supplementary report:

Upon the receipt of these plans they were duly examined and reported upon by the Engineering Division, and in accordance with the recommendations therein, you had them returned to the village unapproved, and in your letter of transmittal you inclosed the report of the Chief Engineer setting forth the reasons and recommendations for their disapproval. These plans were again recently referred to you for further consideration and action, by Mr. Wyman S. Bascom, village attorney and chairman of the sewer committee, in a letter dated December 27, 1908, accompanying which was submitted a brief setting forth his views as to the position of the village in regard to the matter and setting forth his reason for reversing the ruling of the Department made September 29th, disapproving these plans for repairs, and for now approving the same and issuing a permit for their use.

You accordingly referred these plans again to the Engineering Division, with instructions to review and report upon them in the light of the additional information submitted in the letter and brief above referred to and of other facts, beliefs and opinions expressed at a conference held at the Department by you on January 7, 1909, at which Mr. Bascom and his son were present. I, accordingly, made a re-examination of the plans and have considered carefully the present situation in Fort Edward in regard to sewerage and the requirements for sewage disposal, and, at your request, I have worked out alternate proposals by which it might be possible to give approval of these plans and at the same time protect the general policy which you have consistently adhered to of not permitting the discharge of additional raw sewage into the waters of the State.

These plans for the repairs of the sewerage system of the village show clearly that they are primarily reconstructions and alterations of the existing system, and cover two districts having two proposed outlets, one into the Hudson river on the line of Brown's lane extended, and the other into Bond creek at a point about 100 feet east of Rogers street extended. Both sewers are on the "combined plan," and neither has any provision for purification. Neither of these sewers is in conformity with the plans of a comprehensive system already approved by this Department, and further, we were informed, that the village has entered upon or has completed the construction of them.

There can be no question then as to the failure of the village to comply with the law in regard to these sewers, and whether this is a result of error in judgment or not, the authorities now show an inclination to have the matter straightened out in a proper manner.

The course that the village should now pursue in regard to these two sewers should take into consideration the conditions of the design and construction already performed. An examination of the plans shows that it would be possible, first, to construct two main intercepting sewers and a portion of the disposal works which are parts of the system approved by the Department in 1907, these main sewers to be extended so far as it would be necessary to intercept the two sewers under consideration. This would involve the construction of the 8-inch, 10-inch and 12-inch sewers of the system approved in 1907 on McCrea, Mill and Broadway streets, intercepting the 15-inch sewer at Valley and McCrea streets; and the construction of the 12-inch and 15-inch lines on Notre Dame, State, Broadway, Montgomery and Old Fort streets, intercepting the 18-inch sewer at Notre Dame and Rogers streets.

This plan would be the most practicable and in the end most economical one for the village to follow now, and by doing this it would give an opportunity to intercept all of the dry weather sewage of these two as well as other existing combined sewers of the village, and to treat the sewage temporarily and so far as treatment would be required by any new permit issued by you, until complete treatment might be required. The comprehensive system already approved could then be started and could be developed as required in the future. No construction would thus have to be abandoned in the future, and the cost of these two intercepting lines and the partial purification works, which could in all probability be arranged for a considerable period in the future, without resorting to pumping, would not be great nor a burden for the village to bear. Such a plan is, therefore, recommended by me as the best alternative, under the present circumstances.

The other alternative would be to approve temporarily the present sewer upon condition that two purification plants be constructed, one on each line, for the purification of the sewage. Temporarily, such a plant might properly comprise plain sedimentation or septic tanks and should be located on the lower portion of each sewer line. It should be designed to receive only the dry weather sewage and be so "regulated" as to permit storm water during rains to be "by-passed." In the future these tanks would have to be supplemented by complete purification. This plan is, however, not recommended since the interception of these two existing sewers would have to be made in the future when the system already approved, with its disposal works, is begun and developed, at which time these proposed temporary purification works would have to be abandoned. In case of adoption of this latter plan by the village, it will be necessary for the village to submit to the Department for approval plans of the sedimentation or septic tanks.

I should, therefore, recommend that these two propositions be submitted to the village for consideration and that they be requested to make a choice of which they prefer, and to submit at once an application, with plans and a full statement as to their course, to the Department for approval. I should also recommend that they be advised that no approval would be given for the "temporary" plan above proposed except on condition that no more sewers shall be constructed in the village except in full accordance with plans approved by the Department in 1907.

Respectfully yours,

THEODORE HORTON,

Chief Engineer

ALBANY, N. Y., *February* 17, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of the examination of plans for a reconstruction of the old sewer system, together with plans for disposal works for the village of Fort Edward submitted to the Department for approval February 12, 1909.

The plans comprise duplicate blue prints of map of village showing location of sewers and proposed septic tanks, duplicate blue prints showing plans and sections of septic tanks, together with a report and duplicate specifications.

Original plans for a complete sewerage system and disposal works were approved by this Department in February, 1903. This system, however, was not constructed. Revised plans, showing several changes in the plans of 1903, were approved by the Department September 17, 1907, but the system as shown by these plans was not constructed.

On September 29, 1908, plans for repairs and enlargement of the old combined sewer system were disapproved by this Department, whereupon the village submitted a brief asking for a reconsideration of the Commissioner's decision on the ground that the village had only $20,000 at their disposal, enough to make the desired repairs, while the construction of the system as approved in 1907 would cost about $100,000.

The plans now under consideration were resubmitted on February 12, 1909, and are in conformity with the second alternate temporary plans outlined by me in my report to you of January 11, 1909, as being one of the two possible conditions upon which approval was recommended.

The sewers cover two districts having two outlets, one into the Hudson river on line of Brown's lane extended, and the other into Bond creek at a point about 100 feet east of Rogers street extended. Both sewers are on the "combined plan," each of which is provided with a settling tank located near the outlet. The sewers are adequate as to grade and capacity to satisfactorily take care of all the sanitary sewage for the two districts covered by them.

The settling tank near Bond creek is calculated to serve about 800 persons but has a capacity of 73,500 gallons in order to take care of the large amount of ground water in that section. The tank on Brown's lane outlet is designed to serve about 400 persons but has a capacity of only 24,700 gallons owing to the small amount of ground water met with in that locality. The above capacities are adequate to care for the sanitary sewage or dry weather flow and the inlets to the tanks are so arranged as to permit storm water during rains to be " by-passed."

I, therefore, recommend that these temporary plans be approved and a permit be issued allowing the discharge of the effluent from these temporary tanks into Bond creek and the Hudson river embodying the conditions recommended in my report of January 11, 1909, with the further provision that the weirs regulating the amount of storm water " by-passed " shall at any time be adjusted to meet the requirements of this Department.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

PERMIT

Application having been duly made as provided by section 76 of the Public Health Law, as amended by chapter 468 of the Laws of 1903, permission is hereby given to the board of trustees of the village of Fort Edward to discharge effluent from the proposed sedimentation tank at Bond creek and at Brown's lane into the waters of Bond creek and the Hudson river at the points shown on plans within the municipality of Fort Edward in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable or subject to modification or change at any time when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the existing pollution of the waters into which the effluent is discharged.

2. That all sewers hereafter constructed in the village of Fort Edward shall conform with the plan for sewerage approved by this Department on September 17, 1907.

3. That the adjustable weirs to regulate the proportion of flow in the sewers during times of storm that may be by-passed directly to the streams shall be set and maintained at such elevations as may at any time be required by this Department.

4. That whenever in the judgment of the State Commissioner of Health it shall be deemed necessary or desirable, the sewage disposal plant for which plans were approved on September 17, 1907, shall be constructed within the period stated at such time and the sewage collected by the sewers shown on accompanying plans shall be conveyed to and treated in said plant.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

February 17, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Washington county.

FULTON

On July 21, 1909, plans for the reconstruction of the intercepting sewer along the towpath of the barge canal on the east side of the city of Fulton were submitted by the city engineer for approval. These plans were approved on July 27, 1909, and a permit was issued allowing the discharge of sewage from the above sewer into the Oswego river subject to the usual conditions.

FULTONVILLE

In June, 1908, complaint having been made to the Department of the need of sewerage in the village of Fultonville, an inspection of local conditions was made by a representative of the Engineering Division. A copy of his report, given in the Twenty-ninth (1908) Annual Report, pp. 162–164, was sent to the village board of trustees and they were urged to take up without delay the preparation of a plan of sewerage and sewage disposal for the entire village.

In accordance with the above recommendations, plans for a sewer system and disposal plant were submitted to the Department for approval on August 10, 1909. The plans were found to be defective and the matter of their revision was taken up with the designing engineer. They were resubmitted on September 21, 1909, but owing to certain omissions were again returned to the village board of trustees. Further correspondence followed and the plans were approved on October 2, 1909, and a permit was issued.

ALBANY, N. Y., *September* 23, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report on an examination of plans for a proposed sewer system and disposal plant in the village of Fultonville, Montgomery county, recently submitted to this Department for approval.

These plans were first submitted to the Department for approval on August 10, 1909. An examination of them by the Engineering Division, showed that there were so many corrections and alterations that should be made in the design that it was considered that the most expedient way to have these plans corrected was to have the designing engineer come to Albany and receive, verbally, suggestions concerning these alterations.

At the request of the Department the designing engineer called on September 10, 1909. It was pointed out to him that, in order to have the plans in satisfactory shape to meet the requirements of the Department, it was necessary to increase the grades of the sewers in certain streets so as to produce self-cleansing velocities, to insert manholes at all dead ends and at all changes of grades and alignments in order to facilitate cleaning and inspection, to limit the distance between manholes to 500 feet and to provide some means for sewage disposal. These plans were resubmitted to the Department on September 21, 1909, revised largely in accordance with the above suggestions, but it was found, upon re-examination, that some corrections had been omitted and that the exact location of the proposed sedimentation tank was not shown. Owing to these omissions the plans were again returned to the village trustees, together with a letter stating that it would be necessary to show the exact location of the effluent pipe on the plans so that the location of the point of discharge into the Mohawk river could be described in the permit.

The village of Fultonville is located on the south bank of the Mohawk river about twenty-six miles above Schenectady. The village has had a backward growth for a number of years. In 1890 it had a population of 1,122; in 1900, 970; in 1905, 912, and the engineer's report states that the present population is 915.

The proposed sanitary sewer system is a comprehensive system covering the greater portion of the area within the corporation limits. The plans show that it is proposed to provide for a separate system of cellar drains for the low flat section of the village situated between the Erie canal and the Mohawk river. These drains are to be laid in the same trench with and below the sanitary sewers. This arrangement will tend to relieve the sewers from excessive infiltration of ground water.

Owing to the comparatively low and level area near the river most of the sewers in this section are designed with minimum grades. The system should, however, be adequate as to size and capacity, if properly constructed, to meet any probable demand for a considerable period in the future.

The sewage collected by the system is to be carried to a point about 500 feet east of Franklin street and treated in a sedimentation tank before being discharged into the river. This tank is to be constructed with two compartments and will be large enough to provide for about seven hours' detention for the present population.

In view of the fact that the Mohawk river is not used as a source of water supply between Fultonville and its confluence with the Hudson river, except at Cohoes, where steps are being taken to protect the supply by a system of filtration; and since it is claimed that it will be impossible to install the proposed sewer system if more complete purification is required at the present time, owing to a lack of funds, it is my opinion that it would be expedient, in this case, to permit the temporary discharge of effluent from the proposed sedimentation tank, until a definite understanding and policy is reached in regard to the elimination of other and more important pollution of the Mohawk river.

I would, therefore, recommend, that the plans be approved and a permit issued allowing the temporary discharge of effluent from the proposed sedimentation tank into the Mohawk river until such time as the State Commissioner of Health shall require a more complete system of sewage purification.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

PERMIT

Application having been duly made to the State Commissioner of Health, as provided by section 77 of the Public Health Law, chapter 49 of the Laws of 1909, constituting chapter 45 of the Consolidated Laws, permission is hereby given to the board of trustees of the village of Fultonville to discharge effluent from the settling tank to be constructed into the waters of the Mohawk river about 500 feet east of Franklin street within the municipality of Fultonville in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of the Mohawk river or the unsatisfactory operation of the settling tank.

2. That both the sewer system and the sewage disposal plant shall be constructed in full conformity with the approved plans, or such as may hereafter be approved by this Department; and that all the sewage to be collected by the proposed sewers shall be passed through the sewage disposal plant.

3. That whenever in the opinion of the State Commissioner of Health an extension or enlargement of the proposed settling tank or supplementary or additional treatment may become necesary, satisfactory detailed plans for such enlargement or for supplementary or additional treatment shall be submitted to the Department for approval, and upon approval of said plans such additional works shall be constructed within the time limit then specified.

4. That no surface or storm water from streets, roofs or other areas shall be admitted to the sewer system.

5. That the granting of this permit shall not be deemed to effect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this state.

EUGENE H. PORTER,

October 2, 1909. *State Commissioner of Health*

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Montgomery county.

GATES

On July 3, 1909, plans were submitted by the supervisor of the town of Gates for a sewer in Jay street to serve a district adjoining the westerly boundary of the city of Rochester. On October 28, 1909, these plans were approved and a permit was issued allowing the discharge of sewage from the Jay street sewer into the Genesee river at the foot of the falls near Driving Park avenue bridge through the west side trunk sewer in Rochester.

ALBANY, N. Y., *October* 27, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to report as follows on plans for a sewer in Jay street in the town of Gates, Monroe county, to serve a district adjoining the westerly boundary of the city of Rochester. These plans were submitted for approval on July 3, 1909, and duplicate copies together with a report describing the sewer were later submitted on request.

Under chapter 603 of the Laws of 1892 a combined sewer to carry both sanitary sewage and surface water was constructed along the westerly boundary of the city of Rochester at the joint expense of the city of Rochester and the residents of a certain district in the town of Gates. This joint trunk sewer is laid from Jay street northerly along the westerly boundary of the city of Rochester to a ravine, thence northeasterly to the Genesee river, discharging at the foot of the falls near Driving Park avenue bridge.

Under the present plans of the city of Rochester in relation to sewage disposal for the city, it is intended to either pump or siphon the sewage carried by the west side trunk sewer across the river and discharge this sewage into a new intercepting sewer.

The sewer shown by the plans submitted for approval is constructed of brick, is from 36 inches to 60 inches in diameter and is intended to be used as a combined sewer. It extends through Jay street from the west side trunk sewer to the Field road in the town of Gates.

The length of the sewer is about 2,700 feet and the upper half is laid on a grade of 0.6 per cent., the lower half on a grade of 0.3 per cent.

The size and grade of the sewer seem to afford adequate capacity for the probable future demands for the conveyance of sanitary sewage that may be made upon it.

Although the sewer is intended to serve as a combined sewer and thus its construction complicates the question of the future treatment of sewage from the section which it serves, I would recommend the approval of the plans and the issuance of a permit, since the sewer system of the city of Rochester, into which the sewer shown by the plans discharges, is constructed on the combined sewer plan and the necessity of properly disposing of sewage carried by such combined sewers must ultimately be met by the city authorities.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

PERMIT

Application having been duly made to the State Commissioner of Health, as provided by section 76 of the Public Health Law, chapter 49 of the Laws of 1909, constituting chapter 45 of the Consolidated Laws, permission is hereby given to the town board of the town of Gates, Monroe county, to discharge sewage from the sewer in Jay street, town of Gates, into the waters of the Genesee river, at the foot of the falls near Driving Park avenue bridge through the west side trunk sewer in Rochester within the municipality of Rochester in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of the Genesee river.

2. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage into the waters of this State.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

October 28, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Monroe county.

HAVERSTRAW

Objection was made by the Harbor Line Board of the War Department to the extension out to main channel of the Hudson river of the outlet sewer of the screening plant of the Haverstraw sewerage system approved by this Department on September 23, 1908 (see Twenty-ninth [1908] Annual Report, pp. 40–42). On application, therefore, from the board of trustees of the village of Haverstraw, and in view of their statement that plans satisfactory to the War Department for an extension of the outlet sewer to the main channel of the river would be prepared at an early date, the following permit was granted on October 4, 1909.

PERMIT

Application having been duly made to the State Commissioner of Health, as provided by section 77 of the Public Health Law, chapter 49 of the Laws of 1909, constituting chapter 45 of the Consolidated Laws, permission is hereby given to the board of trustees of the village of Haverstraw to discharge screened sewage from the village sewer system into the waters of the Hudson river at the westerly bank of the Hudson river near the West street screening plant within the municipality of Haverstraw in accordance with an application for a permit for such discharge made on September 18, 1909, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the unsatisfactory operation of the screening plant or the condition of pollution of the Hudson river.

2. That the time of expiration of this permit shall be one year from date or at such earlier time as the proposed outfall sewer to the main channel of the Hudson river shall be completed.

3. That the screening plant near West street shall be operated in accordance with the plans for sewage disposal for the village of Haverstraw approved on September 23, 1908, and in accordance with the provisions of the permit issued on the same day allowing the discharge of screened sewage from the village sewer system.

4. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

October 4, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Rockland county.

HUDSON

STATE TRAINING SCHOOL FOR GIRLS

On November 4, 1909, plans for contact beds which it was proposed to install as a supplementary treatment of the effluent of the existing septic tank at the New York State Training School for Girls were submitted for approval by the State Architect. These plans were returned to the State Architect on November 8, 1909, together with the letter given below pointing out the inadequacy of the proposed plans. Revised plans were submitted on November 12, 1909, and were approved on November 16, 1909, upon conditions stated in a letter of the same date returning the approved plans.

On December 27, 1909, plans were submitted to care for all of the sewage of the institution and to supersede similar plans approved on November 16, 1909. These plans were approved on December 30, 1909.

ALBANY, N. Y., *November* 8, 1909.

Hon. F. B. WARE, *State Architect, Albany, N. Y.:*

DEAR SIR:— In further reference to plans now before the Department for proposed extensions to the sewage disposal plant at the New York State Training School for Girls, I beg to say:

Following an examination of these plans by our Engineering Division it appears that, judged by standards in accordance with the best modern practice and upon the basis of the design stated in your letter of November 4th, the contact bed system would be of inadequate capacity. I note carefully in your report, however, your reference to the fact that the construction of the fourth bed of the plans presented is rendered impossible at present from lack of funds, from which I infer that the plans which you do present have been worked out with this limitation in view and that the design has been adjusted as to capacity to meet the funds which are available for this construction.

As I have previously pointed out to you, I believe it is very desirable in constructing sewage disposal plants for State institutions that they should be along lines of best modern practice and of ample capacity, and I believe it is the duty of this Department to see that this is done so far as it is possible. I appreciate at the same time your position in this matter, if my assumption as to limitation of funds is correct, and I believe the design as presented is worked out along generally satisfactory lines.

Referring now more in detail to the plans, I note that you provide an area of about 0.04 acre for the beds, which are to be four feet deep and upon the basis of population which you assume this will require a filtration at the rate of 550,000 gallons per acre per day. I note, however, that you use 50 gallons per capita, basing this very correctly upon the metered rate of water consumption. This rate of 50 gallons is about half the rate usually used by municipalities, and, although I do not question in any way this use of 50 gallons per capita per day, the use of this figure indicates that the sewage is of considerably stronger strength than normal domestic sewage, and for this reason the same rates that would be generally used in designing the area of contact beds would not be applicable for the present case; in other words, it is the organic matter furnished by any given number of people which it is necessary to take care of, and in designing beds the population is a more important factor than the actual quantity of sewage which affects the condition of its concentration or dilution.

For this reason the figure of 550,000 gallons per acre is entirely too high under the conditions given and is, in fact, about double the rate which is found to be satisfactory in good practice. It would, therefore, be desirable to increase the area of the beds at two fold, or possibly resort to some other method of purification such as the use of sprinkling filters where a greater capacity is secured for the same size bed, due generally to the more efficient action of aeration in sprinkling filters over the contact bed.

In view of the above, I am somewhat constrained at this time to reserve any approval of the plans presented until I hear further from you as to the feasibility of substituting sprinkling filters for contact beds, or whether it is practicable to increase the area of contact beds as shown upon your plans. It would seem from the layout that there is ample available head for sprinkling filters, although it may be possible that there are other local conditions which may preclude the adoption of this type.

Since the sprinkling filter can purify from two to three times the volume of sewage per cubic yard of material than the contact bed, the superiority of this method over the contact bed is apparent if it is possible to use the sprinkling type.

Trusting that I may hear further from you in regard to this matter and assuring you of my interest to see this disposal plant constructed along most efficient lines, I beg to remain,

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

ALBANY, N. Y., *November* 16, 1909.

Hon. F. B. WARE, *State Architect, Albany, N. Y.:*

DEAR SIR:— I am returning herewith plans for supplementary treatment in contact beds of the effluent of the existing septic tank at the New York State Training School for Girls at Hudson, N. Y., which I have approved upon the condition that this portion of the system of disposal shall be used for the treatment of only one-half the sewage of this institution until additional similar beds equal to twice the number of beds shown upon the plans have been constructed.

In your letter to me of November 12th you state that you propose that the work be advertised for bids and that proposals be asked for the work as shown and specified, and also additional proposals for twice the number of beds to be installed in the same locality and manner as shown upon the drawings, and that after obtaining the proposals you will then be in a position to ask for additional appropriations for these additional beds. My approval of these plans is, therefore, given with the further understanding that the additional appropriations for these additional beds will be asked for at your earliest opportunity.

Trusting that the approval herewith given will meet with your satisfaction, I bed to remain,

Very respectfully,
ALEC H. SEYMOUR,
Acting Commissioner of Health

ALBANY, N. Y., *December* 29, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report on an examination of revised plans for a proposed extension to the sewage disposal plant at the New York Training School for Girls at Hudson, submitted to this Department for approval on December 27, 1909.

Plans for an extension to the sewage disposal plant at this institution consisting of contact beds for the supplementary treatment of effluent from the existing septic tank were approved on November 16, 1909, on condition that the system of disposal provided for by these plans should be used for the treatment of only one-half the sewage of this institution until additional similar beds equal to twice the number of beds shown upon those plans shall have been constructed.

The plans now under consideration are to supersede the original plans and are revised in substantial conformity with the recommendations embodied in your letter to the State Architect dated November 8, 1909.

I, therefore, recommend that the plans be approved.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

ITHACA

On December 28, 1908, plans were submitted by the sewer commission of the city of Ithaca showing sewers constructed in that city prior to 1908, and subsequent to the installation of the general sewer system. On February 26, 1909, these plans were approved and a permit was issued allowing the discharge of sewage from these sewers into Cayuga inlet after treatment in the sewage disposal plant.

On March 30, 1909, application was received from the board of public works for the approval of plans for sewers proposed to be constructed in Bryant park tributary to the city sewage disposal plant. On April 15, 1909, these plans were approved and a permit was issued allowing the discharge into Cayuga inlet of sewage from the above sewers after such sewage shall first have been treated in the septic tank maintained by the city of Ithaca.

On August 31, 1909, application was received for the approval of plans for a proposed sewer to extend south on Hudson street from the manhole of the existing sewer at the intersection of Pleasant and Hudson streets to the city line. On September 13, 1909, these plans were approved and a permit was issued allowing the discharge into Cayuga inlet of sewage from the proposed sewer extension through the outlet of the city sewage disposal plant.

LAKE PLACID

On August 18, 1909, plans were approved for sewer extensions in Park, Lake, Paradox and School streets and McClenathan avenue, and a permit allowing the discharge of treated sewage into the Chubb river was issued on the condition that all the sewage to be collected by the proposed sewers shall be passed through the sewage disposal plant for the village of Lake Placid.

LANCASTER

On July 12, 1909, application was made by the board of sewer commissioners of Lancaster for the approval of plans for a proposed change in the village sewer system. These plans were approved on July 13, 1909.

ALBANY, N. Y., *July* 13, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report on an examination of plans for a proposed change in the sewer system of the village of Lancaster, Erie county, submitted to this Department for approval July 12, 1909.

Plans for a comprehensive sewer system and disposal plant were approved by the Department June 30, 1907. Minor changes in the sewer system and location of the disposal plant were approved on December 30, 1909.

The plans now under consideration show that it is proposed to omit the sewers shown on the original plans in Delaney street and in parts of Oakwood avenue, Lenox avenue and Lake avenue and to change the size of sewers in Clark street, Linden avenue, part of Madison street and Trenton avenue from 8 inches to 12 inches in diameter so as to carry the sewage from a large portion of the village south of Cayuga creek through Clark street, Linden avenue, Madison street, Trenton avenue to Oakwood avenue instead of carrying it down Delaney street and Lenox avenue to Oakwood avenue. It is stated that the above changes are necessary because it is proposed to form a lake on the site covered by the sewers to be omitted.

The plans are found to be satisfactory as to capacity and velocity of flow and in view of the above, I recommend that they be approved.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

MALONE

On April 15, 1909, application was made by the board of trustees for the approval of plans for sewerage and sewage disposal for the village of Malone. On May 4, 1909, these plans were approved and a permit was issued allowing the discharge of the effluent from the septic tank into the Salmon river.

ALBANY, N. Y., *April* 29, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report on an examination of plans for a complete sewer system and for disposal works for the village of Malone, Franklin county, recently submitted to this Department for approval.

The plans and documents comprise the following:

1. Duplicate report.
2. Duplicate specifications.
3. Detailed estimate of cost of construction.

Tracings and black prints of the following sheets:

4. Topographical map and plan of sewers.
5. Septic tank with details of same.
6. Details of appurtenances.
7. Profiles of sewers.

The village of Malone is situated in the town of Malone, Franklin county. The corporation includes an area of about two and one-half square miles and had a population of 6,478 in 1905. The present population is estimated to be about 7,500. Salmon river flows west and north through the village and within the village limits falls about 100 feet, the fall being controlled by dams at five different points. This stream is tributary to the St. Lawrence river and has a drainage area of 179 square miles above Malone. With the exception of a comparatively small section near the eastern part of Main street, the slope toward the river is quite steep.

Malone takes its water supply from springs and, as far as it is known, no municipality uses the Salmon river, below Malone, as a source of water supply.

The sewer system consists of about 25 miles of sewers ranging from 6 inches to 30 inches in diameter. As has been noted above, the topography is such as to make it possible to secure grades that will produce self-cleansing velocities and to convey the sewage of the entire village by gravity, except the sewage from a small section near the paper mill, to a point below the village for disposal. The plans show that the sewage from this small area is to be carried across the river by gravity to a point within 320 feet of the disposal plant from which point it is to be discharged into the first manhole outside the septic tank by a Shone Sewage Ejector.

The plans have been carefully examined and it is found that the entire system is well and economically designed. With the exception of the main trunk sewer, the grades are sufficient to produce self-cleansing velocities and the sewers are adequate as to capacities to meet any probable demands that may reasonably be made upon them when the territory within the present corporation limits shall have been developed, provided that no roof, surface or other storm water be admitted to the system.

On the basis of 20 persons per 100 feet of sewer, allowing 300 gallons per person as the maximum rate of contribution and making due allowance for ground water infiltration, it will be found that the contribution at station 61—18 will be about 9 cubic feet per second, while the 24-inch pipe on the proposed grade of 0.10 per cent. has a capacity of about 6 cubic feet per second when flowing full and the 15-inch pipe on the proposed grade of 2.02 per cent. has a capacity of 7.5 cubic feet per second when flowing full.

The grades of the main trunk sewer between station 49+43 and station 61+18 would have to be increased so as to meet the probable future flow of 9 cubic feet per second, if this sewer were to be constructed on the same basis of carrying capacity as the rest of the system.

On the same basis the maximum contribution at station 30+93 will be about 10 cubic feet per second, and at station 22+71 the contribution will be about 12.8 cubic feet per second. The proposed 30-inch sewer on a grade of 0.06 per cent. has a capacity of about 8.5 cubic feet per second when flowing full. In order to make the system of equal efficiency throughout, the size of the main trunk sewer between station 3+25 and the station 30+93 should be increased so as to care for a future flow of about 13 cubic feet per second.

It is evident, therefore, that the basis of design on which the main trunk sewer was planned does not provide against so great a future sewage flow per unit of area served, as has been planned for in the design of the other parts of the system. It is justifiable, of course, to assume a smaller maximum rate of flow in the design of trunk sewers than is assumed in designing the contributing parts of the system, owing to the compensation of the fluctuating flows in the lateral sections of the system when the sewage from several such subdistricts is brought together in one trunk sewer.

Allowance is made in this case, however, for a rather limited maximum rate of flow, should all the area within the village limits be developed within the life of the sewer system. Further, the fact that the trunk sewer is at several points laid parallel with the stream and below the level of the water in the stream, gives rise to the possibility of an overtaxing of this sewer by reason of an excessive infiltration of ground water.

I am of the opinion, however, that with especial care given to insure tight joints in this sewer and on the understanding that, should the growth of the village bring about a contributing population materially exceeding 20,000, the trunk sewer might become overtaxed, approval may be given to the plans for the entire system, including the trunk sewer, as presented.

The septic tank is divided into two compartments and has a total capacity of about 399,000 gallons. This is large enough to give a detention of nine and one-half hours for a future population of 10,000 persons allowing a contribution of 100 gallons per capita with both compartments operating. One compartment will give a detention of about six and one-half hours for the present population at the average rate of 100 gallons per capita contribution.

The plans also show a tentative location for sprinkling filters for use when such treatment shall be required in the future, and the report of Charles E. Collins, designing engineer, states that the septic tank is to be located at an elevation high enough above high water to give a head of eight feet upon filter beds five or six feet deep.

I, therefore, recommend that the plans be approved and a permit be issued containing the usual provisions as to revocation and allowing the discharge into the Salmon river of effluent from the septic tank.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

PERMIT

Application having been duly made as provided by section 77 of chapter 45 of the Consolidated Public Health Law, permission is hereby given to the trustees of the village of Malone to discharge effluent from the septic tank to be constructed into the waters of the Salmon river north of the corporation limits within the town of Malone in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of the Salmon river.

2. That both the sewer system and the sewage disposal plant shall be constructed in full conformity with the approved plans.

3. That no surface or storm water from streets, roofs or other areas shall be admitted to the sewer system.

4. That whenever required by the State Commissioner of Health, satisfactory detailed plans of sprinkling filters or other works for the complete treatment of the entire sewage of the village of Malone shall be submitted to this Department for approval and upon approval of said plans such additional works shall be constructed within the time limit then specified.

5. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

May 4, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Franklin county.

MEDINA

On October 11, 1909, application was made by the board of sewer commissioners of the village of Medina for the approval of plans for proposed sewers in the west side sewer district. On November 15, 1909, these plans were approved, and a permit was issued allowing the discharge of sewage into Oak Orchard creek subject to the usual conditions. On December 13, 1909, permission was given for the temporary omission from construction of certain portions of the above sewer system.

ALBANY, N. Y., *November* 11, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to report on an examination of plans for proposed sewers in the west side sewer district in the village of

Medina, Orleans county, submitted for approval on September 30, 1909, an application for approval of the plans having been received from the sewer commissioners on October 11, 1909.

The plans consist of a duplicate sewer map of the district, together with profiles in duplicate of the proposed sewers.

The district to be sewered under the present plans lies west of West avenue and south of the Erie canal and comprises an area of 670 acres.

Plans for sewers in the central and east side districts of the village of Medina were approved by this Department on February 27, 1907, and plans for an extension of the main outfall sewer in Glenwood avenue were approved on September 21, 1907.

The sewage from the central and east side sewer districts is conveyed through a 24-inch sewer laid on a grade of 0.15 per cent. to the main outfall sewer of the village. The capacity of this 15-inch sewer provides for an ultimate population of twenty persons per acre over the entire area of 850 acres comprised by these two districts, on the assumption of a maximum rate of 300 gallons per person per day.

The main sewer from the proposed west side sewer district passes through Commercial street and discharges into the main outfall sewer in Glenwood avenue, which, as stated above, also receives sewage from the central and east side districts. The capacity of the outlet sewer in Commercial street is 9.5 second feet, which, allowing a maximum rate of contribution of 300 gallons per person per day, will provide for a population of thirty persons per acre over the entire area of 670 acres comprising the west side sewer district.

The minimum size and grade for any considerable section of the main outfall sewer for the entire village through Glenwood avenue, except for a small section of cast-iron pipe sewer under Glenwood lake, is thirty inches on a grade of 0.3 per cent. This gives a capacity of 19 second feet, whereas the combined capacity of the two outfall sewers discharging into the main outfall sewer is 17.4 second feet.

From the above it will be seen that, whereas the proposed sewers in the west side sewer district are considerably larger than would be necessary for any demands which would be made upon them in the immediate future, and while the capacities of the outlet sewers from this new district and from the two districts to the east provide for conveying the sewage from a population of upward of 35,000 persons — the present population of the village being approximately 6,500 — the capacities of the main sewers of the system are well balanced and provide a liberal allowance for future growth of the village, and the plans, therefore, on this score merit approval.

In other respects the proposed sewers are well designed as to capacities and velocity of flow.

The question of the discharge of sewage from the village into Oak Orchard creek was reviewed in my report to you at the time of the examination of plans for sewers in the central and east side sewer districts, and at that time a provisional permit, revocable at any time, was granted for the discharge of sewage into this stream.

In view of the above, I beg to recommend that the plans as presented be approved and that a permit be granted allowing the discharge into Oak Orchard creek of sewage to be collected by the proposed sewers.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *December* 13, 1909.

Board of Sewer Commissioners, Medina, N. Y.:

GENTLEMEN:— In response to the application made to me by your Board, in accordance with a resolution adopted on November 26, 1909, asking for my approval of the temporary omission from construction of certain portions of the permanent general sewer system for the west side sewer district in the village of Medina, plans for which were approved by this Department on November 15, 1909, I hereby certify my determination to approve and do approve of such temporary omission from construction, until in the judgment of the State Commissioner of Health or of the sewer commissioners of the village of Medina such portions may be necessary, of certain portions of said sewer system, to wit:

First, that portion of the trunk sewer from the north line of the New York Central and Hudson River Railroad Company's land to the center of Oak Orchard street.

Second, the 8-inch tile sewer in Fuller street between Park avenue and Center street.

Third, the 8-inch tile sewer in Florence avenue between Park avenue and Center street.

The above approval is duly given this 13th day of December, 1909, in accordance with section 260, Article XI of chapter 64 of the Consolidated Laws, the Village Law.

ALEC H. SEYMOUR,
Acting Commissioner of Health

MONTICELLO

On December 9, 1909, plans were submitted by the board of sewer commissioners for a proposed sewer system and a sewage disposal plant for the village of Monticello. On December 16, 1909, these plans were approved and a permit was issued allowing the discharge of the effluent of the proposed sewage disposal plant into Tannery brook. On December 17, 1909, permission was given for the temporary omission from construction of certain portions of the proposed sewer system.

ALBANY, N. Y., *December* 14, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report on an examination of plans for a proposed sewer system and a sewage disposal plant for the village of Monticello, Sullivan county, submitted to this Department for approval on December 9, 1909.

The plans were properly submitted in duplicate accompanied by duplicate copies of specifications and engineer's report. The plans submitted include the following:

1. Topographical map of the village showing plan of proposed sewers and sewage disposal works.

2. Five sheets of profiles of streets and sewers showing details of manholes.

3. One sheet showing plan and sections of disposal works.

The village of Monticello is located at the headwaters of one of the tributaries of the Neversink river which empties into the Delaware river below Port Jervis. It has a normal population of about 1,300 which is said to increase to 4,000 during the summer season.

The proposed sanitary sewer system is comprehensive and provides sewerage facilities for practically all the territory within the corporation limits. The plans show that it is proposed to convey by gravity to the disposal plant the entire sewage of the village, except that from a small section toward the north. The sewage from this small section when developed can either be discharged into the proposed disposal plant by means of pumping or as stated in the designing engineer's report the section that is being developed north of the village will probably co-operate with the village and provide an additional sewage disposal plant for this sewer district. It is proposed, however, to temporarily omit the construction of these sewers as well as a few extensions tributary to the disposal plant.

The topography of the village is such as to give steep grades and require numerous drop manholes in order to control the velocities in the sewers. Flush tanks are to be installed at the upper end of all sewer lines.

It is understood that it is proposed to admit the washings from a tannery into the sewers. Owing to the usual detrimental effect of tannery wastes on sewers and sewage purification works, I would call attention to the fact that it may be necessary for the village authorities to require that these wastes receive preliminary settling tank treatment before they are discharged into the sewer system.

The sewers are adequate as to sizes and capacities to meet any probable demand that may reasonably be made upon them for a considerable period in the future, and, in fact, the main intercepting sewer seems somewhat larger than would be required and could probably be decreased with safety.

The sewage disposal plant consists of a septic tank, contact beds and broad irrigation beds.

The sewage is to be discharged into a grit chamber from which it will be delivered into a septic tank divided into three compartments having a total capacity of 180,000 gallons or adequate to give a detention of about fourteen hours for the sewage contributed by 4,000 persons at a rate of 75 gallons per capita.

Although it is noted in the report that the design of the sewage disposal plant is based upon a population of 6,000 and upon a water consumption rate of 30 gallons per capita, not less than 75 gallons should be allowed for, since, with a limited water supply, sewage is stronger and provision must be made for sufficient area of contact beds and filters and sufficient capacity of septic tank to properly treat the sewage. The proposed septic tank has, however, sufficient capacity to give proper detention of sewage for reasonable service in the future.

From the septic tank the sewage passes into two dosing chambers provided with two pairs of 12-inch alternating siphons for delivering the septic tank effluent to three contact beds having a combined area of 0.3 acres and an average depth of about four feet. At a rate of contribution of 300,000 gallons per day the contact beds will be required to operate at a rate of 1,000,000 gallons per acre per day.

This rate of operation is somewhat high and the design of the disposal plant is not well balanced in this respect. Although sufficient for present needs it will be necessary to enlarge the beds whenever the estimated contribution of sewage for which the disposal plant is adequate in capacity is materially increased in order to maintain a proper efficiency of treatment in the contact beds, and to prevent clogging which is usually caused by excessive rates of operation. The efficiency of the beds is, however, somewhat increased by the reversal of flow of the effluent through the beds during filling and emptying.

Each contact bed is provided with a timed siphon in order to deliver the effluent to distributing channels to the irrigation field which consists of three beds, two of one acre each in area and one of two acres. These beds have a slope of .6 per cent. from west to east and are level from north to south. It is proposed to underdrain the beds with 3-inch and 5-inch tiles which are to discharge into the stream. The rate of operation of the irrigation fields will be 75,000 gallons per acre per day, for a contribution of 300,000 gallons.

A small stream tributary to the Neversink river has its source in the village and flows through the irrigation field. It is proposed to change its course through the disposal plant and it is understood that the flow of this portion of the stream in order to prevent erosion of the beds is to be regulated by means of a diverting dam above the sewage disposal works. The effluent from the plant is to be discharged into this stream.

Port Jervis, located about thirty miles below Monticello, takes part of its water supply from the Neversink river during certain periods of the year.

In conclusion, I beg to again call attention to the features of the design criticized above; viz., the somewhat over-large outlet sewers and the limited area of the contact beds.

The provision for surplus capacity in the outlet sewers is, however, an error on the side of safety and is not so serious as to warrant the disapproval of the plans, although I would recommend that this question be given further study before the construction of the system.

The design of the contact beds, providing as it does for a relatively much higher rate of operation for the same amount of sewage to be treated than do the other portions of the plant as compared to standard rates of operation, results in an inconsistency of design which will require the enlargement of the contact bed area before an increase is needed in the capacity of the septic tanks and in the area of the irrigation beds.

However, I believe that the net capacity of the plant is sufficient for present needs and for any demands that may be made upon it for a reasonable period in the future and that the sewage disposal works, if properly constructed and operated, should produce a satisfactory effluent.

I therefore recommend that the plans for sewerage and sewage disposal be approved and that a permit be issued allowing the discharge into Fairchild or Tannery brook, a tributary of the Neversink river, of effluent from the proposed sewage disposal plant. Respectfully submitted,

THEODORE HORTON,

Chief Engineer

PERMIT

Application having been duly made to the State Commissioner of Health, as provided by section 77 of the Public Health Law, chapter 49 of the Laws of 1909, constituting chapter 45 of the Consolidated Laws, permission is hereby given to the board of sewer commissioners of the village of Monticello to discharge effluent from the sewage disposal plant to be constructed in connection with the proposed sewerage system for Monticello into the waters of Fairchild or Tannery brook at the point of outlet shown by the plans within the municipality of Monticello in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the unsatisfactory operation of the sewage disposal plant or the condition of pollution of Fairchild (Tannery) brook or the Neversink river.
2. That both the sewer system and sewage disposal plant as shown by plans approved this day shall be completely constructed in full accordance with such plans.
3. That no surface or storm water from streets, roofs or other areas shall be admitted to the proposed sewers.
4. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

EUGENE H. PORTER,
State Commissioner of Health

December 16, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Sullivan county.

ALBANY, N. Y., *December* 17, 1909.

Board of Sewer Commissioners, Monticello, N. Y.:

GENTLEMEN: — In response to the application made to me by your board under date of November 5, 1909, asking for my approval of the temporary omission from construction of certain portions of the permanent general sewer system for the village of Monticello, I hereby certify my determination to approve and do approve of such temporary omission from construction, until in the judgment of the State Commissioner of Health or of the sewer commissioners of the village of Monticello such portions may be necessary, of certain portions of said sewer system, to wit:

"All of that line of sewer on the Thompsonville road and tributary thereto. All of that line of sewer designed to discharge into the northerly end of carrier channel of reduction tank and tributary thereto. Pleasant View avenue, Cold Spring avenue, south of main outlet branch and the street running west from Cold Spring avenue opposite said branch. St. John's street, south of Clinton avenue. Fairchild and proposed extension of Oakley avenue. Park avenue from a point 590 feet south of Stanton street. The street east of Park avenue, south of Stanton street. The Forestburg road and Broadway west of Forestburg road. The street running easterly from the northerly end of Liberty street. The 400 feet on westerly end of Jefferson street and the section designed for sewerage of the streets on the south and west of Colonial park development."

The above approval is duly given this 17th day of December, 1909, in accordance with section 260, article XI of chapter 64 of the Consolidated Laws.

EUGENE H. PORTER,
State Commissioner of Health

MT. VERNON

On March 11th, plans were approved for sewerage in the Fleetwood sewer district, and a permit was issued allowing the discharge of sewage from this district into the Hutchinson river after treatment in the sewage disposal plant.

On April 16th, plans were approved for sewerage in Chester Hill park, and a permit was issued similar to that above.

On October 4th, plans were approved for intercepting sewers from Fulton lane and Seventh street to the disposal works and from Hillside avenue near Grand avenue to the sewage disposal works.

NEWARK

STATE CUSTODIAL ASYLUM

On July 8, 1910, plans were submitted by the State Architect for alterations and extensions to the sewage disposal plant for the New York State Custodial Asylum at Newark. As is shown in the following report the combined area of the filter beds was barely sufficient to produce satisfactory operation of the plant with the amount of sewage to be treated at present, but in view of the limited appropriation available the plans were approved on July 13, 1910, with the condition that the four filter beds be constructed as shown, and that additional filter bed area be added to the plant before any material increase occurs in the discharge of sewage from the institution.

ALBANY, N. Y., *July* 12, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of an examination of plans for an alteration of the sewage disposal plant for the Newark Custodial Asylum recently submitted to this Department for approval by the State Architect.

Plans for a sewage disposal plant for the Newark Custodial Asylum were approved by this Department April 3, 1907. This plant provided for septic tank treatment followed by supplementary treatment on sand filters.

It is proposed to substitute contact beds for the present sand filters since the existing beds cannot handle the increased amount of sewage, and it was not found feasible to enlarge the present sand filters owing to the topography at the site. It was, therefore, necessary to install a type of filter that would treat septic tank effluent at a greater rate than sand filters.

Owing to the limited appropriation allowed for making these alterations it is stated that it is proposed to ask for bids for three contact beds and for four contact beds, each having an average area of 1,140 square feet (20 x 57) and 3.5 feet deep.

The total area of three beds is about 0.08 acre, and the area of four beds is about 0.1 acre. The present population of the institution is 880 and gaugings show that the average daily contribution of sewage amounts to 62,000 gallons, or 70 gallons per capita per day. At this rate the three contact beds, as shown on the plans, would be required to treat septic tank effluent at the rate of about 775,000 gallons per acre per day while four beds would have to handle septic tank effluent at the rate of about 600,000 gallons per acre per day which is somewhat high for beds 3.5 feet deep, but may be allowed, unless it is found that the beds will not operate satisfactorily owing to the difficulty of obtaining a greater area with the appropriation available. Also, it is impossible to arrange for greater depth of filter than 3.5 feet without a large increase in the cost, because the septic tank and outlet sewer which determine the elevation of the bottom and the top of the contact beds are already constructed.

It is estimated that the ultimate future population of the institution will be about 1,400 persons. At the rate of 70 gallons per capita this will give a contribution of 98,000 gallons of sewage per day or equivalent to a rate of about 930,000 gallons per acre per day for four beds of the size shown on the plans. The above rate is entirely too high and operation at such rate would tend to clog the filters quickly and consequently increase the cost of maintenance so that before the present population is materially increased it will be necessary either to enlarge the proposed beds or to add additional units.

The plans show that it is proposed to install a new siphon chamber with four plural alternating siphons and discharge valves which are intended to control the dosing of the beds so that each bed in rotation may be filled, remain full for a proper period, emptied and allowed to rest for a desired length of time.

The septic tank is to be utilized as now constructed except that some of the piping is to be altered, and is large enough to allow about seven and one-half hours' detention for a maximum flow of 98,000 gallons of sewage per day.

Owing to the large amount of sewage to be treated and the shallowness of the beds it will be necessary to construct the four beds as shown on the plans in order to give reasonable assurance that the beds will operate satisfactorily, and, as above pointed out, an extension of the filter bed area will be necessary before any material addition to the sewage discharge from the institution occurs.

I would, therefore, recommend, in view of the limited appropriation available, that the plans be approved with the understanding that the four filter beds shown by the plans are to be constructed at once and that additional area of filter beds be added before the population at the institution has materially increased.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

NEW ROCHELLE

On April 8, 1909, application was made by the board of public works for the approval of plans for sewer extensions in Beechmont, Halcyon park, and Sunset View park. On May 4, 1909, these plans were approved and a provisional permit was issued allowing the discharge of sewage into Long Island sound.

ALBANY, N. Y., *April* 14, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report on an examination of plans for sewer extensions in the city of New Rochelle, Westchester county, submitted to this Department for approval April 8, 1909.

The plans and documents consist of the following:

1. Tracing and black print of a contour map of the section to be sewered showing location of proposed sewers.
2. Tracing and black print showing profiles of main sewers.
3. Black print showing details of appurtenances.
4. Report in duplicate.

The records of the Department show that original plans for a sewer system were approved December 19, 1888. Since that time plans for extensions and alterations to this system have been approved from time to time.

The plans now under consideration are for extensions of the present system and are to serve about 143 acres of land in what is known as Beechmont, Halcyon park and Sunset View park. The proposed sewers reach the limits of the watershed in that section of the city that is tributary to the city system and are to discharge into Long Island sound through an existing outlet at a point about 800 feet beyond Bailey's rock.

The proposed system, considered from a point of adequacy as to grades and capacities, is found to be satisfactory to meet any probable demands that may reasonably be made upon it for a considerable period in the future, providing the system is used for sanitary sewage only and so constructed as to exclude excessive amounts of ground water.

The present population of the city is 21,000. The present population to be sewered is probably only a few hundred, but, when fully developed, may be 9,000. At present sewage from 7,000 or more of total population (one-third of city in southwesterly section) is treated in a chemical precipitation sewage disposal plant and discharged into Long Island sound.

The sewage from the remainder of the city is discharged well out into Long Island sound under plans approved by the Department in 1904, and the sewers proposed are tributary to this outlet.

The nearest oyster beds along the north shore of Long Island sound are located off David's island, about one mile southwesterly from the point of discharge of the present outfall sewer. Only a few beds are located at this point. The nearest considerable group of beds along the north shore are three miles southwesterly from the point of discharge. The nearest oyster beds along the opposite or southerly shore of Long Island sound are off Manhasset Neck and about two miles from the point of outlet.

Owing to the comparative remoteness of any oyster beds from the existing outlet of the system of which the proposed sewers will be an extension, I am of the opinion that it will not be necessary to require at the present time a thorough purification of the sewage now discharged at this outlet from the existing sewers and the proposed extensions. I do believe, however, that with the rapid development that has taken place along this shore of Long Island sound the importance of the oyster industry which must be protected, the desirability of curtailing visual pollution and possible offense in these waters, and your consistent policy with the municipalities along this shore, it is necessary to require clarification of this sewage in the immediate future, and to require that suitable provision be made to increase the efficiency of this purification at such a time or times in the future as local conditions may in your opinion demand.

I, therefore, recommend that approval of the plans for these extensions of sewers in Beechmont, Halcyon park and Sunsetview park districts be given upon the following conditions:

1. That within one year satisfactory, detailed plans be submitted to the Department providing for a clarification of the sewage by efficient screening or sedimentation, or a combination of both, and that such plans shall show in detail also suitable works for the complete purification of the sewage.
2. That upon the approval by the State Commissioner of Health of such plans, such clarification works shall be constructed and be completed within the time limit stipulated.
3. That suitable extensions to such works and supplementary works for more complete treatment shall be constructed when in the opinion of the Commissioner they may become necessary.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

PERMIT

Application having been duly made as provided by section 77 of chapter 45 of the Consolidated Public Health Law, permission is hereby given to the board of public works of the city of New Rochelle, to discharge sewage from the proposed sewers in Beechmont, Halcyon park and Sunsetview park into the waters of Long Island sound at the point of discharge of the present outfall sewer near Bailey's rock, within the municipality of New Rochelle, in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of Long Island sound.

2. That within one year satisfactory, detailed plans be submitted to the Department providing for a clarification of the sewage by efficient screening or sedimentation, or a combination of both, and that such plans shall show in detail also suitable works for the complete purification of the sewage.

3. That upon the approval by the State Commissioner of Health of such plans such clarification works shall be constructed and be completed within the time limit stipulated.

4. That suitable extensions to such works and supplementary works for more complete treatment shall be constructed when in the opinion of the Commissioner they may become necessary.

5. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage into the waters of this State.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

May 4, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Westchester county.

NORTH PELHAM

On September 29, 1909, application was made by the board of trustees of the village of North Pelham for the issuance of an amended permit allowing the commencement of the construction of the village sewer system, plans for which were approved on August 18, 1908 (see Twenty-Ninth [1908] Annual Report, vol. II, pp. 55–60), before the completion of the disposal plant for the town of Pelham. On October 11, 1909, this application was granted and the permit given below was issued.

On December 20, 1909, revised plans providing for minor changes in alignment in the proposed sewer system were submitted to the Department for approval. On December 21, 1909, the plans were approved under the conditions of the permit issued by this Department on October 11 1909.

PERMIT

Application having been duly made to the State Commissioner of Health, as provided by section 77 of the Public Health Law, chapter 49 of the Laws of 1909, constituting chapter 45 of the Consolidated Laws, permission is hereby given to the board of trustees of the village of North Pelham to discharge sewage from the proposed sewer system for North Pelham into the waters of Hutchinson river, at the point of outlet of the sewage disposal plant to be constructed by the Pelham board of sewage disposal works within the municipality of Pelham Manor, in accordance with the plans for sewerage for the village of North Pelham, approved on August 18, 1908, and in accordance with the plans for sewage disposal for the town of Pelham approved on July 27, 1909, under the following conditions:

1. That this permit shall be considered as amending and superseding the permit granted to the board of trustees of the village of North Pelham on August 18, 1908.
2. That all the sewage to be collected by the proposed sewer system shall be treated in the sewage disposal plant for the town of Pelham for which plans were approved on July 27, 1909.
3. That no storm or surface water from streets, roofs or other areas shall be admitted to the proposed sewer system.
4. That no sewage shall be admitted to the proposed sewer system until the proposed intercepting sewer and sewage disposal plant for the town of Pelham, plans for which were approved on July 27, 1909, shall have been constructed.
5. That this permit shall be revocable at any time by the State Commissioner of Health, or subject to modification or change if in the judgment of the said Commissioner, it shall become necessary or desirable; and the granting of this permit shall not be

deemed to affect in any way action by said Commissioner on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

October 11, 1909.

. NOTE.— This permit to become operative must first be recorded in the county clerk's office of Westchester county.

OGDENSBURG

On May 21, 1909, and on October 6, 1909, plans were approved for sewer extensions in Washington street, and permits were issued allowing the discharge of sewage into the St. Lawrence river.

On November 8, 1909, plans were approved for a sewer extension in Ford street, and a permit was issued allowing the discharge of sewage into the St. Lawrence river.

OLEAN

On March 31, 1909, the mayor of Olean called at the Department in reference to proposed sewer extensions in that city. He stated that on January 1, 1909, the city limits were extended so as to include North Olean, East Olean and Boardmanville, increasing the population from 13,000 to 20,000; that it was necessary to provide sewerage facilities for the eighth ward, comprising the last two sections; and that the city wished to arrange for the construction of trunk sewers to serve these two districts, and wished advice as to the best plans for constructing such trunk sewers, it being desired to discharge sewage to be collected by these trunk sewers into Olean creek about five hundred feet from its mouth.

He was advised to submit a tentative plan for the sewers, giving the conditions pertinent to the construction and design of such sewers and to submit formally any inquiries the city desired to make relating to the question of sewage disposal.

In accordance with this advice tentative plans for these sewer districts were submitted on April 12, 1909. These were carefully examined by the Engineering Division and returned to the city on April 27, 1909, together with a copy of the following report:

ALBANY, N. Y., APRIL 19, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report on an examination of tentative plans for a proposed sewer system in that section of the city of Olean, formerly known as Boardmanville and East Olean, Cattaraugus county, recently submitted to this Department for consideration.

These tentative plans, consisting of a contour map upon which the locations of proposed sewers are sketched, are submitted by W. H. Mandeville, mayor of the city of Olean, with a view of ascertaining if the system is adequate as to grades and capacities, and if this Department will permit the discharge of sewage from the proposed system into Olean creek.

Considering the first question of the adequacy of the sewerage system it is found that the main outfall sewers are of sufficient capacity to meet any probable future demands providing the sewers are used for sanitary sewage only, and that the sewers are so constructed as to exclude excessive quantities of ground water. The grades appear to be suitable to produce self cleansing velocities.

In regard to the point of discharge, in my opinion, it is not advisable to allow the sewage from the proposed system to be discharged into Olean creek since the estimated population to be served by this system in the near future is 5,000, and such discharge would probably create a nuisance on account of insufficient dispersion and dilution, especially during certain dry periods of the year. After a careful inspection of Olean creek had been made in 1907 by this Department, it was deemed advisable to deny the application of the village authorities of North Olean, then in charge of the sewer system, for permission to delay the construction of both the River street and Buffalo street sewage disposal plants, and to discharge the raw sewage from a population of less than 2,000 persons directly into Two Mile and Olean creeks.

Although there is very little pollution of Olean creek above the city of Olean, there are four outlets into the creek, including the outlet from the sewage disposal plant at what was formerly known as North Olean. Of the remaining three outlets, one discharges surface water, another is a storm water overflow and a third discharges sewage from about 1,000 persons. The last outlet is at a point near the proposed outlet into Olean creek.

I, therefore, recommend that, in order to avoid the possibility of creating a nuisance by the discharge of additional sewage into Olean creek, the proposed outlet be extended to discharge into the Allegheny river; and that it be required when the plans are finally submitted to this Department for approval, that such plans show the proposed outlet extended to the Allegheny river and that the plans be accompanied by a report of the designing engineer giving the basis of design together with a description of the proposed system and a discussion as to the feasibility of intercepting in a trunk sewer the sewage to be collected by the system in order to convey such sewage to a suitable site for a city sewage disposal plant when in the future, sewage disposal shall be required.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

In accordance with the recommendations in this report, detailed plans for a comprehensive sewer system were submitted to this Department for approval on June 1, 1909. These plans were approved on June 4, 1909, and a permit was issued allowing the discharge of sewage from the proposed sanitary sewer system in the eighth ward of the city of Olean into the Allegheny river, about 1,700 feet east of the mouth of Olean creek.

ALBANY, N. Y., *June* 2, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report on an examination of plans for a proposed sanitary sewer system in the eighth ward, formerly known as Boardmanville and East Olean, in the city of Olean, Cattaraugus county, submitted to this Department for approval June 1, 1909.

The plans and documents consist of the following:

1. Tracing and blue print of a topographical map of the eighth ward showing location, sizes and grades of the proposed sewers.
2. Profiles of the proposed main sewers in duplicate.
3. Tracing and blue print showing details of proposed manholes.
4. Report by the city engineer in duplicate.

The plans now under consideration are final detail plans covering the same territory as the tentative plans submitted to this Department for consideration April 12, 1909, and are in accordance with the recommendations embodied in the report dated April 19, 1909.

The plans show that it is proposed to discharge the sewage from this district into the Allegheny river at a point about one-third of a mile above its confluence with Olean creek and the report of the city engineer states that, when it shall become necessary to purify the sewage of the city of Olean, it is proposed to intercept the sewage from the eighth ward at a point a short distance south of the P. S. & N. Railroad tracks and carry it across Olean creek; thence along the creek and Allegheny river intercepting the sewer now discharging into Olean creek below the foot of East State street and the present sewer discharging into the river at the foot of Fourth street and to concentrate this sewage (and sewage collected by other sewers in the city) at a disposal plant to be located at a point along the river below the city.

The sewers for the territory shown upon the plans, as submitted, are adequate as to sizes and capacities to meet any probable demand that may reasonably be made upon them for a considerable period in the future. If, however, the city limits should be extended in the future to include the 150 acres of land lying to the north of Boardmanville, stated in the city engineer's report to be naturally tributary to this system, it would, perhaps, be well to increase the size of the proposed sewer in Pond street from fifteen inches to twenty inches in diameter. It would not in any case be necessary to increase the size of the proposed 24-inch outfall sewer.

It would be advisable to extend the outfall sewer so that the outlet will be at all times submerged. Such an arrangement would undoubtedly postpone to some extent the time when, on account of the condition of pollution of the river the treatment of the sewage from the city will be required.

Although as a result of a sanitary inspection of the Allegheny watershed recently made by this Department it is not deemed necessary that sewage disposal be required immediately, at the same time some definite consideration should be given at this time to the ultimate desirability and necessity for treatment of the sewage of the city of Olean before its discharge into the Allegheny river.

I would, therefore, recommend that the plans be approved and a permit be issued allowing for the present the discharge of sewage into the Allegheny river, such permit to include a condition which shall state that whenever required by the State Commissioner of Health complete plans satisfactory to this Department for the separation and treatment of the entire sanitary sewage of the city shall be prepared and submitted to this Department for approval, and that within the time then specified the construction of any or all works shown by said plans as may be stipulated shall be completed.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

PERMIT

Application having been duly made as provided by section 77 of chapter 45 of the Consolidated Public Health Law, permission is hereby given to the common council of the city of Olean to discharge sewage from the proposed sanitary sewer system in the eighth ward of the city of Olean into the waters of the Allegheny river at about 1,700 feet east of the mouth of Olean creek within the municipality of Olean in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable or subject to modification or change at any time when in the judgment of the State Commissioner of Health such revocation, modification or change

shall become necessary or desirable by reason of the existing pollution of the Allegheny river.

2. That the above sewer system shall be constructed in full conformity with the plans as approved.

3. That no surface or storm water from streets, roofs or other areas shall be admitted to the said sewer.

4. That the granting of this permit shall not be deemed to affect in any way action by this Department in the case of future applications that may be made for permission to discharge additional sewage into the waters of this State.

5. That whenever required by the State Commissioner of Health complete plans satisfactory to this Department for the separation and treatment of the entire sanitary sewage of the city shall be prepared and submitted to this Department for approval and that within the time then specified the construction of any or all works shown by said plans as may be stipulated shall be completed.

EUGENE H. PORTER,
State Commissioner of Health

June 4, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Cattaraugus county.

On August 28, 1909, application was made for the approval of plans to change the alignment of the outfall sewer of the eighth ward sewer district so as to discharge into the Allegheny river, at a point about 600 feet west of the outlet shown on the original plans, this being necessary on account of the inability to secure a right of way across the property as first planned. The size and grade of the outfall sewer is to remain the same. These plans were approved on September 11, 1909, and a new permit similar to that issued on June 4, 1909, was issued.

ONEONTA

On August 30, 1909, application was received from the board of public works for the approval of plans for sewer extensions in Chestnut and Gilbert streets, Fonda avenue, and West Broadway.

These plans were approved on September 22, 1909, and a permit allowing the discharge of sewage from the above sewers into the Susquehanna river was issued on the condition that plans for sewage disposal shall be submitted to this Department for approval on or before April 1, 1911.

ALBANY, N. Y., *September* 14, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report on an examination of plans for proposed sewer extensions in the city of Oneonta, Otsego county, submitted to this Department for approval on August 30, 1909.

The records in the Department show that, although the city of Oneonta submitted a plan of the city showing all sewers constructed up to the year 1905 according to the provisions of chapter 468 of the Laws of 1903, no plans for the construction of sewers have been submitted for approval since that time.

It was stated by the city officials in conference with Chief Engineer Horton, on August 12, 1909, that sewers in certain streets in the westerly section of the city have been constructed without first securing the approval of the commissioner as required by the Public Health Law owing to ignorance in regard to these requirements.

The plans now under consideration cover sewers constructed and to be constructed in Chestnut street, Fonda avenue, West Broadway and Gilbert street. Of these the sewers in Chestnut street and a portion of Fonda avenue are already constructed. These sewers were at first designed to carry both sewage and storm water but since the catch basins have not been constructed the city officials were advised to convert these sewers into sanitary sewers inasmuch as the city is at present sewered practically entirely upon the separate plan, and in view of future separation and treatment of the sewage of the city, the sewers could not be approved as combined sewers.

The sewers in Chestnut street and Fonda avenue vary in diameter from eight inches to fifteen inches. From the intersection of Fonda avenue and West Broadway to the river it is proposed to construct 12-inch sewers.

The plans indicate that it is proposed to construct a lamphole at the intersection of Broadway and Fonda avenue and on the Gilbert street sewer below River street. Manholes should be substituted at all these points to facilitate cleaning and inspection. For the same reason a manhole should be inserted at the change of alignment in the sewer on Gilbert street below Henry street or the sewer should be constructed on a straight line between a manhole at the intersection of Gilbert and Henry streets and the river. The maximum distance between manholes should not exceed 500 feet.

The profile of the sewer in Fonda avenue shows the changes of grade with no manholes which should also be required in order to facilitate cleaning and inspection.

I should suggest that the plans might be approved with the provision that the manholes be inserted as noted above. As respecting the pollution of the Susquehanna river by the discharge of untreated sewage from the city of Oneonta, I believe that some steps should be taken at this time looking toward the concentration of the sewage at one point and its treatment before discharge into the river. Such a requirement would be consistent with the requirements which have been laid down in relation to Binghamton and other places on the Susquehanna river and in relation to the cities of Hornell, Elmira and Corning on the Chemung river, a tributary of the Susquehanna river. The two latter cities are now constructing sewers and will be allowed to discharge additional sewage into the Chemung river under permits which provide that plans for an intercepting sewer and sewage disposal works shall be submitted to this Department for approval early in 1910.

The permit issued to the common council of the city of Binghamton for discharge of sewage from the fourth ward sewer requires that plans for a complete system of intercepting sanitary sewers and sewage treatment works for the collection and treatment of the sewage of the entire city at a site favorably located below the city shall be submitted by the city of Binghamton to the State Commissioner of Health for his approval before April 1, 1910.

The drainage area of the Susquehanna river above Oneonta is 690 square miles. The population per square mile on this drainage area, not including the population of Oneonta, is forty-two persons; and the population per square mile, including the population of Oneonta, is fifty-five persons. In 1907 a sanitary survey was made of the Susquehanna river watershed in New York State, and it was found that while the flow in cubic feet per second per 1,000 population directly polluting the river at a point above Oneonta was 18.1 cubic feet, the discharge at Oneonta of untreated sewage from the city decreases this relative flow to 8.8 cubic feet per 1,000 population connected with sewers and directly polluting the river. The ratios above are based on a minimum mean weekly flow of the river and may be said to be considerably less for shorter periods. It has been found that under normal conditions a flow of at least 7 cubic feet per second per 1,000 population contributing sewage to streams is necessary in order that conditions of nuisance shall not be set up in the stream.

From the above it will be seen that treatment of the sewage of Oneonta should be required in the near future if conditions of nuisance are to be averted.

Further, the stream is used as a source of public water supply of the city of Binghamton located eighty-three miles down the river from Oneonta. The water is purified through mechanical sand filters of the gravity type.

The river receives pollution at many other points on its flow from Oneonta to Binghamton, notably at Unadilla where 1,660 persons are served by sewers discharging directly into the river, and at Susquehanna Depot, Pa., where 2,700 persons are connected with sewers discharging into the river; but the greatest amount of sewage pollution received by the river from its source in Otsego lake to the city of Binghamton and its junction with the Chenango river, is added at Oneonta. It was found during the sanitary survey in 1907 above referred to that sewage from a population of more than 6,000 out of a total population of about 10,000 was discharged into the stream. Recent extensions and the present extensions will undoubtedly increase that number, while any considerable future growth in the city will bring about still greater sewage discharge.

In view of the above, and in order to carry out your intention of curtailing and eliminating as far as possible the pollution of the Susquehanna and other streams of the State, it would seem that some requirement as to concentration and treatment of sewage from the city of Oneonta should be embodied in the permit for which an application is now before this Department.

I would, therefore, recommend that the plans be approved and a permit issued and that, in addition to the usual provisions of the permit, a clause be embodied which shall require that within a specified time plans for an intercepting sewer and for sewage disposal works to collect and treat the entire sanitary sewage of the city shall be submitted to this Department for approval with the further provision that such intercepting sewer and any or all portions of such sewage disposal works shall be constructed at such time as may be deemed advisable by the State Commissioner of Health.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

PERMIT

Application having been duly made to the State Commissioner of Health, as provided by section 77 of the Public Health Law, chapter 49 of the Laws of 1909, constituting chapter 45 of the Consolidated Laws, permission is hereby given to the board of public works of the city of Oneonta to discharge sewage from the extensions to the sanitary sewer system on Chestnut street, Fonda avenue, West Broadway and Gilbert street into the waters of the Susquehanna river near the intersection of Gilbert and Henry streets within the municipality of Oneonta in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when, in the judgment of the State

Commissioner of Health, such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of the Susquehanna river.

2. That no surface or storm water from streets, roofs or other areas shall be admitted to the sewers shown by the plans.

3. That the several manholes shall be constructed as specified in the accompanying engineer's report on the examination of the plans.

4. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage into the waters of this State.

5. That on or before April 1, 1911, plans satisfactory to this Department for complete sewage disposal works to treat the entire sanitary sewage of the city of Oneonta, accompanied by a proper application for the approval thereof, shall be submitted to this Department for approval together with plans for such intercepting and outfall sewers as may be necessary to convey the sanitary sewage of the city to the site or sites selected for such sewage disposal works.

6. That whenever in the opinion of the State Commissioner of Health it is deemed necessary or desirable, any designated portion of or all of said sewage disposal works shall be constructed within the time limit then specified.

EUGENE H. PORTER,
State Commissioner of Health

September 22, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Otsego county.

OSSINING

On August 11, 1908, plans for a complete sewer system were submitted by the board of trustees of the village of Ossining. These plans provided for six different outlets, and there appeared to be no attempt to so design the proposed system as to concentrate, by gravity flow, the sewage from the various outlets to one or two points, a provision which was imperative in view of the need for treatment of sewage. On September 18, 1908, the plans were, therefore, returned to the village clerk together with a report recommending that further study be given to the problems involved in the sewer system and in the treatment of the sewage of Ossining.

Considerable correspondence followed, and the plans were revised and resubmitted on December 30, 1908. They were deficient, however, with respect to the design of the screening chamber, and the location of the chambers on the outfalls was not shown on the plans. The revised plans were, therefore, returned a second time to the designing engineer with a request that the desired data and information be supplied. The plans were amended as suggested and returned for final approval on January 20, 1909. On January 22, 1909, they were approved and a permit was issued allowing the discharge of screened sewage from the proposed sewer system into the Hudson river.

ALBANY, N. Y., *January* 22, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR: — I beg to submit the following report on the examination of plans for a complete sewer system for the village of Ossining, Westchester county, recently submitted to this Department for approval.

The plans comprise a report and specifications together with tracings and black prints of the following:

1. Map of sewer system showing all proposed sewers and location of screening chamber.
2. Large contour map of the village of Ossining in three sheets.
3. Small scale contour map of the village.
4. Contour map of the territory tributary to the Scarborough outlet.
5. Detail of siphon blow-off.
6. Detail of screening chamber.
7. Detail of appurtenances.
8. Thirteen sheets of profiles.

Ossining is located on the east bank of the Hudson river about thirty miles from New York city, and, although the village had a population of only 7,135 in 1905, it will probably have a decided growth in the future on account of its proximity to New York.

The area drained by the proposed sanitary sewer system is about 2.66 square miles and includes almost all sections inside of the corporation limits. The village is intersected by several streams, large and small, which flow between high promontories jutting out toward the river front, and seem to divide the village into six natural drainage areas. This peculiar topography makes it difficult to concentrate the sewage at one point by gravity.

The first set of plans submitted provided for six different outlets, and there appeared to be no attempt to so design the proposed system as to concentrate, by gravity flow, the sewage from the various outlets to one or two points, a provision which is imperative in view of future treatment of sewage. These plans also showed several instances of low slopes for 8 and 10-inch sewers as well as defects in the design of screening chambers.

The plans were, therefore, returned to the village clerk together with a report recommending that further study be given to the problems involved in the sewer system and in the treatment of the sewage of Ossining.

The plans were revised and resubmitted and showed that the suggestions of the Engineering Division had been carried out to the extent that three of the outfall districts, into which the village was divided in the plan previously submitted, had been concentrated into one, with the result that approximately 77 per cent. of the area and 91 per cent. of the population will be served by this outlet. Of the remaining three outlets the most northerly one can, if required, be carried to a point of concentration of the main outfall. The other two outfalls are located in the southerly portions of the village and so situated as to reduce the question of a nuisance to a minimum. This is further facilitated by the design of a siphon in Washington street to divert a large portion of the sewage from areas above Highland avenue, from the Sparta dock outlet to the main concentrating system.

The low grades of the 8 and 10-inch sewers on the original plans were corrected so that the sewer system, as shown by the present plans, is adequate as to size, capacity and grades to satisfactorily meet the probable demand for a considerable period in the future. The design of the screening chamber, however, was deficient, and the location of the chambers on the outfalls was not shown on the plans. The revised plans were, therefore, returned a second time to Mr. George R. Byrne, Consulting Engineer, asking that the desired data and information be supplied.

The plans were amended as suggested and returned for final approval January 20th. Each outlet is provided with a screening chamber located just north of the New York Central and Hudson River railroad and below the last lateral connection.

The screening chambers consist of a baffle board followed by a series of two or three screens. The sludge retained by and between them flows into hoppers provided with buckets which are raised automatically to the level of the screen pulleys for removal. The screens are arranged so as to be easily cleaned and examined. The chambers are in duplicate and proportioned to the volume of sewage to be screened, assuming a width of one foot per 1,000 inhabitants. The minimum width for individual screens, however, is three feet, making a total width of thirteen feet at the main outfall and six feet at each of the others, which is consistent with current practice.

The difference of elevation of the inverts of the sewer at each side of the screening chambers is 0.2 of a foot.

Respecting the arrangement of inlet and outlet of the screening plants, while details are somewhat lacking on the plans, it appears that only at high tide will the screens be submerged, unless a riser pipe has been arranged for outside the plant to connect with the sewer built on the grade shown on the plans, or unless a second valve and outlet is arranged for whose invert elevation is slightly lower than the inlet to each screening plant. The submergence of the screens is a feature which will undoubtedly be found necessary for proper operation of the plants and unless this is already provided for in details not shown on the plans, the necessary changes should be made.

While the plans show that the invert of the main outlet is four feet below the high water level, the designing engineer, in his report, makes the following statement: "In the future when the series of fine screens fail to thoroughly provide a sewage whose disposal by dilution can be satisfactorily accomplished at the present point of discharge; the outfall has been arranged with such a head that it will be possible to carry the main discharge pipe as far into the river as is desirable or to utilize the property, claimed by the town, along side of the outfall sewer and extending out from the front of Central avenue to the pier line, for the construction of a complete series of tanks for septic treatment of screened sewage before its discharge."

I, therefore, recommend that the plans be approved and a permit be issued to allow the screened sewage to discharge into the Hudson river.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

PERMIT

Application having been duly made as provided by section 76 of the Public Health Law as amended by chapter 468 of the Laws of 1903, permission is hereby given to the board of trustees of the village of Ossining to discharge screened sewage from the proposed sewer system into the waters of the Hudson river at the proposed sewer outfalls near Quimby street, Liberty street and the Scarborough station, within the municipality of Ossining, in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable or subject to modification or change at any time when in the judgment of the State Commissioner of Health, such revocation, modification or change shall become necessary or desirable by reason of the existing pollution of the Hudson river, or the unsatisfactory operation of the screening plants.

2. That all the sewage to be collected by the sewer system for which plans are approved this day, shall be passed through the screening plants as shown by the plans before being discharged into the Hudson river.

3. That both the sewers and the screening plants as shown by the plans approved this day, or by plans which may subsequently be approved, shall be constructed in full conformity to said plans.

4. That no additional ground water or storm or surface water from streets, roofs or other areas shall be admitted to the sewer system, and as soon as practicable, arrangements shall be made to exclude such ground water and surface water as is now admitted to the sewers.

5. That whenever required by the State Commissioner of Health, the outfall sewers shall be further extended into the river; either partial or complete sewage disposal plants shall be constructed in addition to or to take the place of the screening plants shown by the plans; and within the time limit stated when such requirement is made, all ground water and surface water drains shall be disconnected with the sewer system.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

January 22, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Westchester county.

OSWEGO

On April 1, 1909, application was made by the commissioner of public works for the approval of plans for sewer extensions in Van Buren, West Third, East Second, Ellen, Varick, West Fifth, and Mitchell streets. On April 20, 1909, these plans were approved and provisional permit was issued allowing the discharge of sewage from the proposed sewers into the Varick and Hydraulic canals, Oswego river, and Lake Ontario at the points of outlet shown by plans.

On April 14, 1909, application was made for the approval of plans for a trunk sewer and for the sewage of East Oswego. On May 21, 1909, these plans were approved and a permit was issued allowing the discharge of sewage from the proposed sewer system into Lake Ontario.

ALBANY, N. Y., *May* 12, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— On April 14th, an application together with plans was submitted for your approval by the commissioner of public works of Oswego, covering a trunk sewer designated as the East Tenth street trunk sewer and a system of combined sewers connected therewith.

Said plans were submitted in duplicate and comprise the following blue prints:

1. Topographical map showing location of proposed sewers.
2. Plans showing details of alignment of the East Tenth street conduit.
3. Blue prints showing profiles of the East Tenth street conduit.
4. Blue prints showing profiles of East Eleventh street sewer.

The examination of these plans was at once commenced, but before it was completed and a report submitted to you, and subsequent to the visit to Oswego by the Chief Engineer to look over the general situation in regard to the design of the system, revised plans were submitted by the city for your approval. The revisions refer more particularly to the design of the lower end of the trunk sewer, providing a new outlet for Harbor brook, and including provisions for future disposal of sewage to be collected by the system. It is these latter plans that my report herewith submitted to you covers.

The proposed sewers are on the combined plan and are to serve a territory consisting of about 360 acres of land in what is known as East Oswego.

The plans show that it is proposed to convert Harbor brook, a small stream that flows through this section from south to north, into a covered sewer from Lawrence street to East Eleventh street between East Seneca and East Cayuga streets.

From this point the combined sewer, six feet in diameter, is to be carried down East Eleventh street and discharge into Lake Ontario at the foot of East Eleventh street.

The system as designed appears from a hydraulic standpoint to be satisfactory so far as capacities, self-cleaning grades and other provisions necessary for a combined system of sewers are concerned. No attempt has ever been made to determine closely how far in the future the capacities will be sufficient for the future growth of this territory. It is quite probable that no difficulty will be experienced for a number of years in regard to capacity for storm water and especially in regard to the sewage contribution which would be small as compared to the storm water provision necessary for a system of sewers of this type.

One of the most important questions which arises at once, however, is in regard to the desirability or necessity of a separation of the sewage of this district, and this was carefully looked into during my visit to Oswego on May 9th, when I personally, in company with the city engineer and superintendent of public works, drove over the sewer district, inspected its character, and possibilities for sewage disposal, and proposed point of discharge into the lake. Whereas I found that a separate system of sewers would cost only a moderate sum of money as compared with the cost of the present combined system, I was informed that there is an urgent clamor in this section for an improvement of the present creek which meanders across and near the main streets in the axis of the valley and into which considerable refuse is thrown. I further found that the slope of the land draining toward this creek is quite steep and that surface drainage is urgently needed in this district. In other words, both systems are urgently needed at the present time, and if provision is made for both to the full extent of covering the entire area, a combined system would evidently be less expensive than a separate system of sanitary sewers and of storm water sewers.

On the other hand, it must be remembered that the new intake for the proposed water supply is located in the lake about two miles from the proposed outlet of this sewer. The outlet is, however, located to the east of the entrance of Oswego river into the lake and consequently the sewage would not be so easily carried to the intake under unfavorable conditions as if this outlet were to the west of the river; that is, relatively on the same side as the intake. Again, the contribution of sewage from this sewer district would probably be relatively small for a number of years to come and would not be a relatively important factor in regard to the danger to the intake.

Whereas the original plans submitted did not make any provision for sewage disposal, the revised plans, upon recommendations of mine made to the engineer during my visit, provided for future disposal when this may be required. This future disposal comprises settling or septic tank treatment with works provided for and shown upon the plans at the outlet of the proposed sewer and ultimate provision for more complete treatment at some other point to be determined upon after study, when such supplementary treatment shall become necessary. This provision for disposal will, therefore, include the treatment, when constructed, of the dry weather flow, which, of course, would provide protection to the water front and the intake during a very large portion of the year.

In view, therefore, of the expressed desire on the part of the city to construct the combined system instead of a separate system of sanitary sewers and surface water sewers, and the provision shown upon the plans for future sewage disposal works when this may, in your opinion, become necessary, I beg to recommend that the plans be approved upon the condition that the sewage disposal works shown upon the plans and such additional purification as may later be necessary, be provided whenever in your opinion it is necessary or desirable.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

PERMIT

Application having been duly made as provided by section 77 of chapter 45 of the Consolidated Public Health Law, permission is hereby given to the common council of the city of Oswego to discharge sewage from the proposed sewer system in East Eleventh and other streets into the waters of Lake Ontario at the foot of East Eleventh street within the municipality of Oswego in accordance with plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall

become necessary or desirable by reason of the condition of pollution of Lake Ontario.

2. That the proposed sewer shall be constructed in full conformity with the approved plans.

3. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage into the waters of this State.

4. That whenever required by the State Commissioner of Health:

(1) Detailed plans satisfactory to this Department shall be submitted for approval, showing settling or septic tanks to treat the dry weather flow of sewage to be collected by the proposed sewers.

(2) Plans for further treatment of such sewage in addition to settling tank or septic tank treatment shall be submitted for approval.

(3) Within the period specified at such time, such sewage disposal works as may be required shall be constructed and put in operation.

EUGENE H. PORTER,
State Commissioner of Health

May 26, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Oswego county.

PELHAM

On July 9, 1909, application was made by the board of sewage disposal works for the approval of plans for a sewage disposal plant for the town of Pelham. These plans were approved on July 27, 1909, and a permit was issued allowing the discharge of the effluent of the sewage disposal plant into the Hutchinson river.

ALBANY, N. Y., *July* 20, 1909.

EUGENE H. PORTER, M.D., *Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report on an examination of plans for a sewage disposal plant for the town of Pelham, Westchester county, submitted to this Department for approval by the Pelham board of sewage disposal works on July 9, 1909.

The Pelham board of sewage disposal works was constituted by legislative enactment which became effective May 28, 1909, known as chapter 544 of the Laws of 1909. The law provides that the board shall be composed of three members to be called the Pelham sewer disposal works commissioners, consisting of the presidents of the three villages in the town of Pelham. This board is authorized and empowered to construct and maintain sewage disposal works for the town of Pelham. The law further provides that the plans for the disposal works shall show a plan for connecting therewith the sewer system of each of the villages of said town.

The three villages in the town of Pelham are North Pelham, Pelham and Pelham Manor. Plans for a sewer system for North Pelham were approved by this Department August 18, 1908. Original plans for sewer system and disposal works for Pelham Manor were approved July 7, 1894. On April 17, 1895, plans for a change in the sewer system of Pelham Manor were approved. On September 28, 1896, plans for a further change of the location of the disposal works were approved and on November 12, 1896, plans for a change in the location of the outlet sewer were approved by the Department. All of the above plans provided for sewage disposal and discharge of sewage effluent into Hutchinson creek in the vicinity of the plant shown in the present plans.

The plans now under consideration show that it is proposed to locate the disposal works on the bank of Hutchinson creek near the intersection of Park Place and Esplanade and that the sewage from present sewer system in the town and the proposed sewer system of the village of North Pelham is to be carried to the disposal works by gravity.

The present population of the town of Pelham is about 2,000 persons and the estimated future population for which the disposal works are designed is about 10,000. The area of the town is about 1,400 acres and all but a small section towards the southeast can be made tributary to the disposal plant without pumping. This would mean an ultimate population of about 28,000 persons when the town is fully developed and built up, assuming a population of 20 persons per acre.

The sewage disposal works, laid out on the concentric plan, consists of two detritus tanks, eight septic tanks and a sprinkling filter. The sewage flows into either of two detritus tanks — located at the center of the plant — through a 36-inch sewer which extends under the sprinkling filter and septic tank. The sewage is screened upon entering the detritus tanks.

From the detritus tanks the sewage flows over a weir into the pumping sump from which it is elevated by a centrifugal pump to a system of radical and circular distributing troughs which allows it to flow into any or all of the septic tanks, over adjustable weirs. The complete plant of eight septic tanks is large enough to provide nearly eight hours' detention for the ultimate contribution of 1,000,000 gallons per day. It is proposed at present to use three of the septic tanks, of which two are to be operated continually and will give about nine hours' detention of sewage to be contributed by the present population of 2,000 persons at the rate of 100 gallons per capita per day.

The sewage is discharged from the septic tanks by flowing over weirs into a circular distributing trough from which it is siphoned through a traveling carriage operated by electric motors and a system of gears which is intended to cause the carriage to move radially at a desired uniform rate. Valves with orifices, the size of which can be regulated by hand, are located along the carriage ten feet on centres. The sewage is discharged through these orifices to splash plates which tend to distribute it uniformly over the filter bed.

The sprinkling filter is to be composed of broken stone eight feet in depth, having a superficial area of about one acre. The filter is to be underdrained by means of three concentric brick underdrains connected with radial horseshoe tile laid side by side. It is proposed to construct one-fifth of the beds at present which will give a rate of about 1,000,000 gallons per acre per day for the estimated present contribution. The size of the bed is to be increased until the ultimate area of one acre is obtained, which will provide for a rate of 1,000,000 gallons per acre per day when the ultimate population of 10,000 persons is reached.

It is stated in the report which accompanies the plans that the septic tank is to be housed and constructed complete as shown upon the plans, but that it is proposed to omit the construction of the roof over the first installation of the filter bed equal to one-fifth of the final area. This omission may be allowed but I would recommend that a clause be embodied in the permit to provide for the housing of this section of the filter bed if, when the plant is put into operation, the filter is found to operate unsatisfactorily owing to freezing or give off offensive odors.

This plant should produce a satisfactory effluent if properly constructed and operated.

I, therefore, recommend that the plans be approved and a permit issued allowing the discharge of effluent from the proposed disposal works into Hutchinson creek (Hutchinson river) with the provision that the sprinkling filter shall be enlarged from time to time as the contribution increases so as to provide for a rate of filtration of 1,000,000 gallons per acre per day, at all times and with the further provision as above recommended relating to covering of the sprinkling filter if found necessary after the plant is put in operation.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

PERMIT

Application having been duly made to the State Commissioner of Health, as provided by section 77 of the Public Health Law, chapter 49 of the Laws of 1909, constituting chapter 45 of the Consolidated Laws, permission is hereby given to the Pelham board of sewage disposal works to discharge effluent from the sewage disposal plant for the town of Pelham into the waters of Hutchinson river at the point of outlet shown by the plans within the municipality of Pelham Manor in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Com-

missioner of Health such revocation, modification or change shall become necessary or desirable by reason of the unsatisfactory operation of the sewage disposal plant or the condition of pollution of Hutchinson river.

2. That the intercepting sewers and the sewage disposal plant shall be constructed in full conformity with the approved plans.

3. That whenever it shall be deemed necessary by the State Commissioner of Health additional units of area of the sprinkling filter shall be constructed and put in operation.

4. That whenever it shall be deemed necessary by the State Commissioner of Health the roof over the sprinkling filter as shown by the plans shall be constructed over the portion of the filter then in use.

5. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

EUGENE H. PORTER,
State Commissioner of Health

July 27, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Westchester county.

PERRY

On May 19, 1909, application was made by the board of sewer commissioners of the village of Perry, Wyoming county, for the approval of plans for a proposed sewer extension in East Genesee street. The plans showed it was proposed to construct a 6-inch sewer 390 feet long to discharge into the present sewer in Genesee street, and that the proposed sewer was to be provided with a lamp-hole at the upper end. Owing to the small size and the comparatively flat grade of this sewer, the plans were returned on May 22, 1909, with the suggestion that the sewer be provided with a manhole at the upper end, in order to facilitate cleaning and inspection.

On June 3, 1909, the amended plans were resubmitted to the Department, and on June 4, 1909, they were approved and a permit was issued allowing the discharge of sewage from the proposed sewer into Silver lake outlet near Water street.

PHOENIX

On October 4, 1909, application was made by the board of trustees of the village of Phoenix for the approval of plans showing a changed location for the sewage disposal plant from the original location in the plans approved on April 30, 1908. (See Twenty-ninth [1908] Annual Report, pp. 65–70.) On October 25, 1909, these plans were approved and a provisional permit was issued.

ALBANY, N. Y., *October* 22, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to report as follows on an examination of plans showing a changed location for the sewage disposal plant for the village of Phoenix, N. Y.

These plans were first submitted for approval on October 4, 1909, and were returned for correction in minor particulars and for the addition of data as to grades and elevations omitted from the map.

Original plans for sewerage and sewage disposal for the village of Phoenix were approved on April 30, 1908. On August 7, 1908, an amendment showing a change in the sewer on Canal street was approved. The present plans show a change in the location of the disposal plant from the original location north of the Oswego canal and west of Davis street with outlet into Brandy brook to a location south of the Oswego canal opposite Davis street, with outlet into the Oswego river. It is proposed to construct the septic tank and filter beds as shown by the original plans and with the same elevations shown by the original plans. The main outlet sewer from Davis and Canal street to the disposal plant will pass under the Oswego canal for the present as an inverted siphon which, on the abandonment of the Oswego canal will be replaced by a gravity sewer.

I beg to recommend that the amended plans showing a changed location of the sewage disposal plant be approved and that a permit be issued allowing the discharge of effluent from the disposal plant into the Oswego river.

Very respectfully,

THEODORE HORTON,
Chief Engineer

PERMIT

Application having been duly made to the State Commissioner of Health, as provided by section 77 of the Public Health Law, chapter 49 of the Laws of 1909, constituting chapter 45 of the Consolidated Laws, permission is hereby given to the board of trustees of the village of Phoenix, N. Y., to discharge effluent from the proposed sewage disposal plant for the village of Phoenix into the waters of Oswego river at a point near the intersection of Canal and Davis streets within the municipality of Phoenix in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the unsatisfactory operation of the sewage disposal plant or the condition of pollution of Oswego river.

2. That all the sewage to be collected by the proposed sewer system for which plans were approved on April 30, 1908, and for which amendatory plans were approved on August 7, 1908, shall be passed through the sewage disposal plant of the village of Phoenix.

3. That both the sewer system and the sewage disposal plant shown by plans approved on the above dates and by plans approved this day shall be constructed in full conformity with said plans or such as may hereafter be approved, except that the com-

plete sewer system when constructed shall conform with recommendations (1) and (2) of the Engineer's report on an examination of the plans for said system, dated May 2, 1908, a copy of which was furnished the village authorities on that date, and that a manhole shall be constructed at the upper end of the proposed siphon.

4. That no surface or storm water from streets, roofs or other areas shall be admitted to the sewer system.

5. That the granting of this permit shall not be deemed to affect in any way action by this Department or any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

October 25, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Oswego county.

PLEASANTVILLE

HEBREW SHELTERING GUARDIAN SOCIETY

On April 15, 1909, plans for a sewer system and for sewage disposal works on the grounds of the Hebrew Sheltering Guardian Society were submitted to this Department for approval. These plans were approved on May 5, 1909, and a permit was issued allowing the discharge of the effluent of the sewage disposal plant into the Saw Mill river.

ALBANY, N. Y., *May* 4, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report on an examination of plans for a sewer system and for sewage disposal works on the grounds of the Hebrew Sheltering Guardian Society at Pleasantville, Westchester county, submitted to this Department for approval by Lederle & Provost, designing engineers, on April 15, 1909.

The institution is located near the head waters of one of the tributaries of Saw Mill river from which, as is stated in the report, the city of Yonkers now takes a portion of its water supply, employing filtration. It is proposed to discharge the effluent from the purification plant of the institution into this stream. For this reason the proposed plant provides for complete purification and sterilization which should be attained if this plant is properly constructed and operated.

The engineers' report states that the ultimate population to be cared for is 1,100 persons and that the proposed sewage disposal works provide for the treatment of 80,000 gallons of sewage per day, equivalent to two-thirds of the ultimate estimated water consumption. This amounts to 110 gallons per capita per day. The report of the designing engineers also states that the disposal works are to be enlarged by the construction of additional units as soon as the amount of sewage to be handled exceeds 80,000 gallons.

The disposal works consist of sedimentation tanks, sprinkling filters, settling basins, sand filters and final sterilizing tanks where the filtrate is to be treated with a solution of hypochlorite of calcium.

The sedimentation tank is divided into three compartments each of which is twenty-eight feet long with an average depth of six feet. It provides for nine hours' detention for 80,000 gallons per day. The bottom of the chambers have a slope of one foot in twenty-eight feet towards the inlet end of the tank and each chamber is connected with a 10-inch sludge drain which leads to the sludge beds. The outlets from the chambers are so arranged as tó equalize the flow to the several units of sprinkling filters.

The sprinkling filters are two in number having a combined area of about 0.054 acres which requires the filter to treat the sedimentation tank effluent at the rate of about 1,100,000 gallons per day. The distribution is effected by means of 4-inch galvanized wrought-iron pipes provided with 4 x ½-inch tees spaced about eleven feet on centres. The liquid, discharging from the tees, falls on splash plates placed two feet below the distributing system and two feet above the filter beds. It is estimated that this method will distribute the liquid uniformly over a number of circular areas eleven feet in diameter. The filters are provided with underdrains for conveying the filtrate into settling basins.

From the settling basins the liquid is to flow into siphon tanks which will discharge given doses onto the sand filters every thirty minutes when the plant is treating sewage at the rate of 80,000 gallons per day.

At the above rate the sand filters will be required to treat the settled sprinkling filter effluent at the rate of about 300,000 gallons per acre per day. The sand filters are about three feet deep having a combined area of about 0.276 acres. The distribution is effected by means of 6-inch vitrified pipes provided with 4-inch lateral vitrified channels spaced five feet on centers. The underdrains are composed of 4-inch laterals connecting with 6-inch collectors leading into a collecting well.

From this well the filtrate flows into the sterilizing tank. Above this tank are located the chemical mixing chambers. The sterilizing tank is provided with a siphon and a ball float to which is connected a rod provided with four hinged levers. As the ball float rises the levers alternately open and shut the valves connected with a dosing tank which discharges four doses of chemicals of 2.3 gallons each onto a splash plate so as to distribute the chemicals over the surface of the filtrate in the sterilizing tank. The mixing of the chemicals with the filtrate before it is discharged into the stream is further aided by causing the effluent to flow through a long shallow tank provided with a series of baffle boards.

The designing engineers state that, in their opinion, substantial sterilization can be produced by adding hypochlorite of calcium in such quantities as to give six to ten parts of available chlorine per million gallons. The exact quantity necessary can only be determined by experiment after the plant is put into operation. It is proposed by the designing engineers that the plant shall either be operated under competent supervision and tests for bacteriological efficiency or that the normal application of chlorine will be fixed sufficiently high to produce sterilization within the limits of safety.

In view of the above, I recommend that the plans be approved and a permit be issued allowing the discharge of sterilized effluent from the proposed plant into Saw Mill river.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

PERMIT

Application having been duly made as provided by section 77 of chapter 45 of the Consolidated Public Health Law, permission is hereby given to the Hebrew Sheltering Guardian Society to discharge effluent from the sewage disposal plant into the waters of a branch of the Saw Mill river at the point shown by the plans within the town of Mount Pleasant in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of the Saw Mill river or the unsatisfactory operation of the sewage disposal plant.
2. That both the sewer system and the sewage disposal plant shall be constructed and operated in full conformity with the approved plans.
3. That no surface or storm water from roofs or other areas shall be admitted to the sewer system.
4. That when the contribution of sewage to the plant shall exceed the 80,000 gallons per day for which the plant is designed, the extensions to the plant as shown upon the plans or such additional extensions as may be required shall be constructed.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

May 5, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Westchester county.

PORT CHESTER

On October 20, 1909, application was made by the board of trustees of the village of Port Chester for the approval of plans for a proposed sewer in Midland avenue and lateral sewers. On December 13, 1909, these plans were approved and a permit was issued allowing the discharge of sewage from the proposed sewers into the Byram river.

ALBANY, N. Y., *December* 8, 1909.

EUGENE H. PORTER, M. D., *Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report on an examination of plans for proposed sewer extensions in sewer district No. 2 in the village of Port Chester, Westchester county, submitted to this Department for approval on October 20, 1909.

General plans for a comprehensive sanitary sewer system for Port Chester were approved by this Department on January 22, 1903, and the plans now under consideration provide for a modification in the sizes, slopes and invert elevations of the sewers in Midland avenue, and show the alignment and location of proposed laterals in Sands, Armett, Leonard, Eldridge and Fawcett streets, and in portions of Edgar place, Cottage and Grace Church streets, all of which are to discharge into the Midland avenue sewer.

Except as noted above and except that it is proposed to temporarily discharge the sewage from the proposed sewers into an existing covered drain called Gun Brook drain at Grace Church street near Beech street, the plans are consistent with those approved in January, 1903. The plans also show that the elevation of the main sewer at the intersection of Grace Church street is such that the flow in this sewer can be intercepted by an intercepting sewer leading to the disposal plant whenever such sewer is constructed and a sewage disposal plant is built and put in operation.

The proposed main sewer in Midland avenue should be adequate as to size and capacity to meet any probable demand that may be made upon it for a considerable period in the future, provided that it is used for sanitary sewage only and is properly constructed so as to exclude infiltrations of ground water as far as possible.

On November 13, 1908, application was made to the Department by the board of trustees of the village of Port Chester for permission to temporarily discharge short sewers in Sands and Armett streets into the Midland avenue drain.

After correspondence with the local board of health, it was deemed advisable to suggest to the village trustees that they consider the construction of a permanent sewer in Midland avenue to receive sewage from laterals in Sand and Armett streets as well as in other streets in the district where sewers were necessary in order to avoid the possibility of the creation of a nuisance by the discharge of sewage into the Midland avenue drain at points where it is not flushed by tidal water.

Subsequently the plans under consideration were drawn up in accordance with this suggestion.

In view of the above and considering that the proposed sewer construction, except as respecting the temporary point of discharge, is in line with the future construction which will be necessary to convey all sewage to the disposal plant site, I am of the opinion that the plans may consistently be approved and a temporary permit issued.

I would call attention, however, to the fact that the proposed construction will result in an increase in the amount of sewage discharge into Byram river and is not, therefore, consistent with the approved plans for sewerage in this section of the village. Further, it should be noted that the concentration and treatment of all the sewage from the village as was shown by the revised plans for the village sewer system approved on January 22, 1903, is not being carried out.

In this connection, it may be said that the progress in Port Chester in properly caring for the sewage of the village is not keeping pace with the methods that are being adopted in other municipalities that discharge sewage or sewage disposal plant effluent into Long Island sound and its tributaries.

In my opinion, the time has come when definite steps should be taken for providing means for treatment of the sewage from Port Chester before its discharge into Long Island sound, and it would seem desirable and reasonable that, in any permit issued for the discharge of sewage from the proposed sewers, a provision be included which shall require the submission of detailed plans for sewage disposal works to treat the entire sewage of the village.

In view of the foregoing, I would recommend that the plans as presented be approved and that a permit be issued, including the usual provisions as to revocation, allowing the temporary discharge of sewage into Byram river through Gun brook drain of sewage to be collected by the sewers shown by the amended plan, and containing the further provision that on or before January 1, 1911, detailed plans for sewage disposal works to treat the entire sewage from the village, shall be submitted to this Department for approval.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

PERMIT

Application having been duly made to the State Commissioner of Health, as provided by section 77 of the Public Health Law, chapter 49 of the Laws of 1909, constituting chapter 45 of the Consolidated Laws, permission is hereby given to the board of trustees of the village of Port Chester to discharge sewage from the proposed Midland avenue sewer and lateral sewers into the waters of Byram river through Gun brook drain at the foot of Purdy avenue within the municipality of Port Chester in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of Byram river or Long Island sound.

2. That no storm or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.

3. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

4. That on or before January 1, 1911, detailed plans, satisfactory to this Department, for sewage disposal works to treat the entire sewage of the village of Port Chester, shall be submitted to the Department for approval, accompanied by a proper application for the approval thereof.

5. That whenever in the opinion of the State Commissioner of Health it shall be deemed necessary or desirable, any designated portion or all of said sewage disposal works, together with such intercepting and outfall sewers as may be necessary to convey the entire sanitary sewage of the village to said disposal works, shall be constructed within such time limit as may be then specified.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

December 13, 1909

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Westchester county.

POUGHKEEPSIE

On April 3d, plans were approved for sewer extensions in Jefferson, Albany and Livingston streets and in Dutchess and Lincoln avenues, and a permit allowing the discharge of sewage from these sewers into the Hudson river was issued, subject to the usual revocation and modification clauses.

RICHFIELD SPRINGS

ALBANY, N. Y., *February* 8, 1909.

MR. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— I beg to report on an inspection of the sanitary sewer system outlet in the village of Richfield Springs, Otsego county, made on January 30, 1909. The investigation was made because of a complaint of the pollution of a stream by discharge from this sewer and because of assurances which had been made to this Department that an agreement had been reached between the complainants and the village authorities to leave the matter with this Department for adjustment.

The village of Richfield Springs lies in the extreme north-central part of Otsego county and is the terminus of the Utica and Richfield Springs branch of the D., L. & W. R. R.

The normal population is estimated to be 1,500 at present. The 1890 census reported 1,623 population. The village enjoys great popularity as a health and summer resort, the summer visitors numbering 1,500 or more.

The water supply, furnished by the municipality, is derived from springs and a lake northeast of the village, is pumped to a distributing reservoir and supplied by gravity to the village.

About twenty-five years ago a sanitary sewer system was constructed, with a main outlet into Ocquionis or Fish creek, at a point several hundred feet from the mouth of the creek at Canadarago lake. This lake is a beautiful body of water about four miles long and one mile wide; the head of the lake lies less than one mile southwest of the village. There is at present but one summer hotel or boarding-house on the lake near the village. This is known as the Lake House, is situated about one-half mile below the mouth of Fish creek and has a capacity of twenty-five guests, with sometimes 200 or 300 transient guests. Picnic and recreation parties visit this property and bathing-houses and a water toboggan slide are maintained. About three miles below this point on the opposite side of the lake is situated a larger summer hotel. On the west side of the lake there are thirty-two summer cottages and on the east side there are eighteen such cottages.

It is estimated that of the normal population of the village, 1,000 persons are served by the sanitary sewer system, of which 300 persons are served by two smaller portions of the system discharging into Fish creek within the village. The hotels housing the 1,500 or more summer visitors are connected with the main portion of the system, making a total of 2,200 or more persons served by the main outlet sewer discharging into Fish creek outside the village limits.

For the past nine years the village authorities have had considerable trouble with the outfall sewer owing to the fact that high water from the lake each spring has produced sufficient pressure in the pipe line to break the joints and allow the sewage to be discharged upon the ground surface along the last 400 or 500 feet of the outlet.

For some time past this portion of the outlet line has been abandoned and the sewage has been allowed to discharge into the creek from a manhole near the bank at the upper end of this section.

It is against this practice and the consequent fouling of the stream from this point to the lake that complaint is made by a representative of the owner of the Butler property through which the stream flows.

In company with Mr. R. P. Johnson, village president, an inspection of the stream and of the territory in the vicinity of the outlet was made. The stream was flowing full, yet the influence of the sewage discharged into the stream was plainly visible for more than one-third the width of the stream for several hundred feet down stream from the manhole.

The drainage area of Ocquionis or Fish creek at its mouth is about twenty-two square miles. The flow of the stream is said to be augmented by the flow from the springs in the village.

However, on the liberal assumption of 0.5 second feet per square mile for dry weather flow it is unlikely that the stream is able to care for the sewage during the summer months without the creation of objectionable conditions.

Owing, doubtless, to the comparatively high water stage of the stream and to the low temperature, no nuisance could be noticed in the vicinity of the point of discharge at the time of inspection, but it is reasonable to assume that during the warm season, when dry weather conditions prevail and the amount of sewage discharged at this point is over three times the present discharge, the stream would be seriously polluted.

There are no residences or farm houses near enough to the point of discharge to be seriously affected by odors from the stream at such time, and the main damage to the Butler property by reason of such discharge of sewage is an injury to the stream as a water supply for cattle in the pasture through which it runs. A remedy for the existing conditions, other than a reconstruction of the sewer along the original routes, and one which has been proposed, would be to continue the sewer straight to the lake from the manhole at which it now discharges into the stream. Such construction would involve a siphon crossing of Fish creek and merely remove the direct pollution from the stream to the lake. Further, inasmuch as the swamp lands adjacent to the stream and the lake are not as suitable as other possible sites for a sewage disposal plant since these lands are overflowed at times of high water and since the location of sewage disposal works near the present outfall would involve pumping of the sewage, it would seem that some other temporary plan of relief should be adopted.

A considerable area of undeveloped lowland lies between the railroad at the southerly boundary of the built-up portion of the village and the lake. It would seem probable that a site for a sewage disposal plant might be selected in this area somewhat nearer the village than the present outlet which would make it possible to deliver sewage at the plant, by intercepting the flow in the present main outlet sewer at a point near the village, at an elevation such that the plant might be operated by gravity. Such a disposal plant site would also involve considerably less expense in the delivery to the plant of sewage collected by the two smaller branches of the system that now discharge into the stream within the village.

The present village board of trustees recognizes the fact that sewage disposal will ultimately be required and appreciate the desirability of eventually treating the village sewage before its discharge into the stream or lake. On this account the board does not feel justified in expending any funds, if such expenditure may be avoided, which will accomplish nothing in line with the permanent solution of the problem, *i. e.,* the treatment of the sewage of the village.

The members of the board of trustees, with the exception of one member who was not present at the meeting, stated that they were willing to offer to the representatives of the Butler property to fence in the stream from the point where it becomes the westerly boundary of the Butler property down to the lake and to extend the village water main and provide a drinking trough for cattle in the pasture adjoining the stream and extending to the highway. This would prevent in a large measure the present damage to the property which occurs during the summer months, and if satisfactory to the complainant would leave the way more open for future action by the village authorities in providing a modern system of sewage disposal, thus permanently benefiting all properties bordering both on the stream and on the lake which are now affected by the discharge of raw sewage.

From the records of this Department it does not appear that the authorities of the village of Richfield Springs have submitted a report of the sewer system as required by section 79 of the Public Health Law. Such omission, therefore, brings the discharge of sewage from the sewer system under the prohibition contained in that portion of chapter 468 of the Laws of 1903, constituting section 75 of the Public Health Law.

This matter was reviewed with the trustees at the time of the inspection and the trustees are prepared to submit a statement describing the sewer system together with a tracing or blueprint of the original sewer system plan.

Recommendations

In view of the present difficulties which have been encountered in disposing of the sewage of the village and in order to place the matter of sewage discharge from the village more properly within the provisions of the Public Health Law, I would recommend that a blank application for permission to continue such discharge be mailed to the board of trustees together with a blank form for a report of the sewer system, said application and report blanks to be filled out and signed by the board of trustees and returned to this Department accompanied by a map of the sewer system as it now exists.

I would further recommend that at the same time a communication inclosing a copy of this report be sent to Mr. C. M. Butler of Geneva, N. Y., who represents the owners of the Butler property, asking him to advise this Department if he considers as satisfactory the steps proposed by the village to relieve the conditions now damaging the Butler property and if he would present any objection to the issuance of a provisional permit allowing the continued discharge of sewage into the stream pending the construction at some future time of a sewage disposal plant by the village, provided the village authorities would execute a satisfactory agreement to construct the fence and provide village water for the pasture on the property as described above.

Respectfully submitted,

H. B. CLEVELAND,
Principal Assistant Engineer

ALBANY, N. Y., *February* 18, 1909.

MR. RICHARD P. JOHNSON, *Village President, Richfield Springs, N. Y.:*

DEAR SIR:— I am enclosing a copy of a report made by Assistant Engineer Cleveland of this Department on an examination of the conditions brought about by the discharge of sewage from the main outlet from the village sewer system into Ocquionis or Fish creek.

I believe that the suggestions made in this report are for the best interests of the village and of the property owners affected by the discharge of sewage from the village system.

Inclosed herewith you will find a blank report of the public sewer system to be filled out and signed by the board of trustees and returned to this Department accompanied by a map or blue print showing the original sewer system together with the location, size and grade of all sewers constructed since May 7, 1903, with the date of construction of such sewers marked alongside.

You will also find inclosed a blank, application for the issuance of a permit to discharge sewage from the sewer system of Richfield Springs into the waters of Ocquionis or Fish creek. This application should be filled out and signed by the board of trustees and submitted to this Department in order that a permit may be issued.

I am this day communicating with Mr. C. M. Butler of Geneva, N. Y., relative to the matter and trust that an agreement will be reached between the village board and Mr. Butler, as outlined in the inclosed report, believing that the action proposed is for the best interests of all concerned.

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

An arrangement was made between the village board of trustees and Mr. Butler whereby the village agreed to construct a fence and to maintain the same for a period of ten years, so that the cattle in his pasture will be prevented from reaching the creek. The village authorities further agreed to construct and maintain a watering trough for the use of the cattle in this pasture.

On July 15, 1909, the following permit was issued to the board of trustees of the village of Richfield Springs:

PERMIT

Application having been duly made to the State Commissioner of Health, as provided by section 77 of the Public Health Law, chapter 49 of the Laws of 1909, constituting chapter 45 of the Consolidated Laws, permission is hereby given to the board of trustees of Richfield Springs to discharge sewage from the main outlet sewer of the village sewer system into the waters of Ocquionis or Fish creek, the present point of outlet near the grounds of the Richfield Springs Agricultural Society within the town of Richfield Springs in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of the waters of Fish creek or of Canadarago lake.

2. That whenever required by the State Commissioner of Health complete plans satisfactory to this Department for the separation, collection and treatment of the entire sanitary sewage of the village of Richfield Springs shall be submitted to this De-

partment for approval; and any or all portions of the sewage disposal plant and intercepting sewers shown by said plans that may be stipulated at the time of approval of said plans shall be constructed and put in operation within the time then specified.

3. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage into the waters of this State.

EUGENE H. PORTER,
State Commissioner of Health

July 15, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Otsego county.

ROCHESTER

STATE HOSPITAL

On January 6, 1909, plans were submitted by the State Architect for a sewer extension and pumping station at the Rochester State Hospital. These plans were approved on January 13, 1909.

ALBANY, N. Y., *January* 12, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report on the examination of the plans for sewer and ejector at the Rochester State Hospital, submitted for approval by the State Architect January 6, 1909.

The plans comprise blue print showing plan and profile of sewers together with details of pump well and appurtenances. One set of specifications was also included.

The sewers consist of about 3,800 feet of vitrified pipe varying in diameter from 6 to 10 inches laid to such grades that should insure self-cleansing velocities.

No roof or storm water is to be admitted to the sewers although they are designed to take care of the subsoil drainage around the buildings served.

All the sewage is screened before entering the pump well from which it is pumped through a 4-inch castiron force main about 600 feet long to a new manhole on the east side trunk sewer. The pump well is large enough to hold several hours' flow of sewage and is emptied periodically by a direct connected 2½ inch centrifugal pump driven by an electric motor operated by an automatic switch control and float apparatus. The pump well is also provided with an 8-inch overflow, connected to the adjacent storm water sewer, to take care of the sewage in case of a breakdown in the pumping system. The specifications specify that the pump shall have a maximum capacity of 180 gallons per minute which is adequate to satisfactorily handle the sewage. In order to better insure continuous operation and satisfactory sanitary conditions, it is advisable to install a duplicate pump.

I, therefore, recommend that the plans be approved with the understanding that, if found necessary owing to interruption of the pumping operation of the plant as designed, an additional pump will be installed.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *January* 13, 1909.

Hon. F. B. WARE, *State Architect, Albany, N. Y.:*

DEAR SIR:— I am sending you herewith the approved plans for sewerage and a sewage pumping station at the Rochester State Hospital submitted to this Department for approval on January 6, 1909.

With respect to the pumping station, it would seem that, in order to provide for continuous operation of the pumping plant in the event of break-downs or stoppage of the pumping apparatus shown, it would be wise to install an additional pump.

Such provision would insure against any creation of a nuisance at the point of discharge of the storm sewer into which overflow from the pumping station would pass, and I am, therefore, approving the plans with the understanding that, if found necessary, owing to any material interruption of the future operation of the pumping plant, as shown by the plans, and the subsequent creation of a nuisance at the final point of disposal of overflow from the pumping plant during such interruption, a duplicate pump will be installed.

Very respectfully,

ALEC H. SEYMOUR,
Acting State Commissioner of Health.

ROME

STATE CUSTODIAL ASYLUM

On June 23, 1909, an investigation was made of the conditions surrounding the discharge of sewage from the Rome Custodial Asylum and of the progress that has been made toward the construction of a sewage purification plant, plans for which were approved by this Department on September 20, 1906. It was found that this disposal plant had not been constructed, and as a result of this omission insanitary conditions existed in an aggravated form. Copies of this report on this investigation (see p. 206 of this volume) were sent to the superintendent of the Rome Custodial Asylum and to the State Board of Charities and they were urged to use their influence or take such action to have the necessary plans for a disposal plant prepared and the construction of this plant completed and the plant put in operation at the earliest possible time.

Plans for a sewage disposal plant for the Rome State Custodial Asylum were accordingly submitted for approval on August 11, 1909, by the State Artchitect. These plans were approved on August 27, 1909.

ALBANY, N. Y., *August* 25, 1909.

EUGENE H. PORTER, M.D., *State Department of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report on an examination of plans for a proposed sewage disposal plant for the Rome

State Custodial Asylum submitted to this Department for approval August 11, 1909, by the State Architect.

Plans for sewage disposal providing for settling tank treatment to be followed by sand filtration were approved by this Department September 20, 1906. The disposal plant provided for by these plans was never constructed. The plans now under consideration contemplate the construction of a settling tank, sprinkling filter and settling basin.

It is stated in the report accompanying these plans that all the sewage from the institution is at present collected in a combined sewer which discharges into an open ditch about one-fourth of a mile distant from the main buildings and finally reaches Wood creek, a tributary to Oneida lake. It is proposed to intercept the storm water near the buildings so that domestic sewage only will reach the disposal plant.

The present combined 16-inch sewer is to be used as far as "Manhole No. 1" from which it is proposed to construct about 635 feet of 8-inch vitrified sewer on a 0.47 per cent. grade to a settling tank. A 10-inch wooden stave pipe is to convey the settling tank effluent to the sprinkling filter, a distance of about 450 feet. Both of these sewers should be adequate as to sizes and capacities to meet any probable future demand.

The present population of the institution is stated to be 1,217, with an ultimate future population of 1,700, and from the metered water consumption for the past two years, the sewage contribution has been taken at 120 gallons per capita per day as a basis of design.

The settling tank, which is about 30 feet long, 23½ feet wide with a depth varying from 6 feet to 10½ feet is divided into three compartments by curtain walls. The sewage flows from a grit chamber into the side compartments through submerged inlets and then into the central compartment through openings in the bottom of the curtain walls. The bottom of the side compartments slope toward the central compartment in such a way that solids in the sewage will tend to collect at the bottom of the latter from which the sludge can be discharged through two 6-inch sludge pipes into the existing 16-inch sewer, thence through a new 8-inch sludge pipe leading to trenches on top of the ground near the sprinkling filter where it will be buried. The settling tank is large enough to provide for about 6½ hours detention for the sewage from the present population and about 4½ hours detention when the ultimate population of 1,700 persons is reached.

From the settling tank the sewage flows into a dosing chamber from which the flow to the sprinkling filter is controlled by a float valve arrangement which tends to maintain a constant head of 7 feet on the nozzles at the filter until the sewage in the settling tank is lowered about two inches when the remainder of the dose in the chamber will discharge under a dropping head.

The sprinkling filter is 6 feet deep and has a superficial area of about 0.09 acres. It is provided with sprinkling nozzles spaced 13 feet on centers. The rate of treatment for the present population will be about 1,700,000 gallons per acre per day. The effluent from the filters is to be collected by means of underdrains and discharged into a settling basin having a capacity equal to about one hour's flow.

The proposed disposal plant should produce a satisfactory effluent if properly constructed and operated. I, therefore, recommend that the plans be approved.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

SHARON SPRINGS

On June 4, 1908, plans were approved for sewer extensions and reconstruction of sewers in the sewer system of the village of Sharon Springs, Schoharie county, and a permit was issued on the condition that plans for a complete sewage disposal plant to treat the entire sewage from the village be submitted to the Department by August 1, 1908. These plans were received by this Department from the designing engineer on August 15, 1908. On September 8, 1908, they were returned to the designing engineer for minor corrections. The amended plans were resubmitted on October 7, 1908, and were ready for approval on October 27, 1908. Owing, however, to the fact that a formal application for their approval was not filed by the village authorities until March 6, 1909, which application was accompanied by a request for a hearing before the plans should be approved in the matter of omitting on first construction certain portions of the complete plant, the plans were not approved until April 16, 1909, on which date a permit was issued allowing the discharge into Brimstone creek of the effluent of the septic tank, comprising a portion of the complete plan.

ALBANY, N. Y., *October* 27, 1908.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— In the matter of revised plans for a sewage disposal plant for the village of Sharon Springs, Schoharie county, I beg to report as follows:

Plans for sewer extensions and reconstruction of sewers in the sewer system of the village were approved by this Department June 4, 1908. (See Twenty-ninth [1908] Annual Report, Vol. II, pp. 95–97). The permit issued the same day stipulated that plans for a complete sewage disposal plant to treat the entire sewage from the village be submitted to the Department by August 1, 1908.

The original plans for a sewage disposal plant were received by this Department from the Designing Engineer August 15th. After a partial examination these plans were returned to the engineer for minor corrections on September 8th, and as now submitted by the engineer under date of October 7th, the plans show the recommended changes.

The village of Sharon Springs is located about two miles south of the Montgomery county line and about two miles east of the Otsego county line. Brimstone creek flows through the village, and has only about one and one-half square miles watershed above the point of discharge of the present sewer outlet.

The winter population of Sharon Springs is, according to the last census, 529. The engineer states that there has been no appreciable increase in the normal population of the village since the census and that no large increase is expected or probable in the near future.

Sharon Springs is, however, a summer resort containing about twenty-three hotels and boarding houses. It is estimated that the maximum number of boarders during August is 2,000, making a total population of about 2,500. The season begins about the middle of June and closes about the 15th of September. It is estimated that the summer population continues at its maximum for not over two weeks during the month of August. It is stated that this summer population has been nearly constant for a great many years.

The sewage is stated to be of purely domestic character. The engineer found the normal flow for May, 1908, to be 178,280 gallons per day. On the basis of 100 gallons per capita per day for the 530 people normally residents of the village, there remains about 125,280 gallons per day for infiltration of ground water.

The maximum summer flow is estimated at about 290,000 gallons per day in which is included the measured normal flow in May and 110,000 gallons for the transient population at 55 gallons per day per capita.

The plans for the disposal works provide treatment for the sewage by septic tank, sprinkling filters and settling basins.

The septic tank is divided into two compartments, each 50 feet long and 10 feet deep. One compartment is 12.5 feet wide and affords a six-hour retention for the normal flow of sewage during the winter. The second compartment is 7.5 feet wide and the total capacity of the two compartments afford a six-hour retention for the maximum flow during the summer season.

The end of the septic tank is crossed by a transverse wall whose height is one inch lower than the maximum height of sewage in the tank. Overhead siphons regulate the discharge of the siphons supplying the sprinkling filters and control the flow so that one inch of sewage is drawn from the main portion of the tank and seven inches from the section behind the end cross wall at each discharge of the siphons.

As indicated above, the effluent of the septic tank is delivered to the distributing pipes of the sprinkling filters by two siphons, one six inches and one eight inches. There are twenty-two 9/16 inch

Columbus 90 degree sprinklers, operated under a maximum head of six feet, designed to spray a total area of filter bed of 0.13 acre. The larger siphon supplies thirteen of these sprinklers.

Assuming that this total area of bed is effective in treating sewage, the maximum rate per day will be under 2,500,000 gallons. The filter is 7.0 feet deep and to be filled with crushed stone of a size to pass a 2½-inch ring but not pass a 1½-inch ring. The filter is drained by 5-inch vitrified horseshoe tile together with 12-inch and 15-inch half tile collectors.

The settling basin is to be 20 feet square and 4 feet deep and affords a one-hour retention for the maximum flow. The effluent of the basin falls over a weir into a collecting channel and is conveyed to Brimstone creek.

Two different areas are designed on the plans for sludge beds, one of which will take the sludge from the septic tank and one that from the settling basin.

With care in the execution of the construction and careful operation, the effluent of the plant should be fairly clear and nonputrescible. The greatest demand upon the plant fortunately comes in the summer time and is of short duration, and it is believed that adequate capacity has been provided for treating the amount of sewage stated in the engineer's report.

In view of the above, I, therefore, beg to recommend that the plans be approved upon receipt of the formal application for approval from the village authorities, as required by law.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

Albany, N. Y., *April* 9, 1909.

Eugene H. Porter, M. D., *State Commissioner of Health,*
Albany N. Y.:

Dear Sir:— I beg to submit the following supplementary report in the matter of sewage disposal for the village of Sharon Springs, Schoharie county.

avoid a repetition of the nuisance which has been created in the stream during the past seasons."

On May 6, 1908, at a hearing granted by you to the village officials who asked that permission be granted to defer the submission of plans for the sewage disposal plant, it was arranged that plans for necessary alterations in the sewer system should be approved at once, provided plans for sewage disposal would be submitted for approval by August 1, 1908.

On May 11, 1908, a committee of riparian owners on the stream below Sharon Springs called at the Department to emphasize the need of sewage disposal at Sharon Springs. It was agreed that an inspection of the stream by a representative of the Department would be made during August, in order that the stream pollution might be seen at its worst.

On August 16, 1908, Assistant Engineer Cleveland visited Sharon Springs and made an inspection of the stream for a mile and a half below the village.

The report (see Twenty-ninth [1908] Annual Report, Vol. II, pp. 181–183) of this second inspection, dated August 17, 1908, shows that the discharge of sewage from the sewer system of Sharon Springs converted the creek from a clear stream showing no visible evidence of pollution, as it was observed above the point of discharge, to a running stream of sewage below the outfall, foul smelling and of unsightly appearance; and that this condition of the stream continued with little improvement for a mile or more downstream as Brimstone creek passed through the farm of L. J. Swift, the upper farm of G. E. Staley and the farm of J. A. Fonda.

The area of the watershed of Brimstone creek at the sewer outlet is one and one-half square miles; augmenting the flow in the stream is an excess of 300,000 gallons per day from sulphur and magnesia springs in the village. Brimstone creek flows through farm lands for three miles to the outskirts of the village of Ames, a hamlet of about two or three hundred population, at which point the watershed area is ten and one-half square miles. The fall in the stream from the sewer outlet to Ames is 140 feet. The fall in the stream from the sewer outlet to the Mohawk river at Canajoharie is 640 feet. Brimstone creek joins Bowman's or

Canajoharie creek at a point about one mile north of Ames, at which the combined watershed area is thirty-one square miles. It then flows to Canajoharie, a total distance of thirteen and one-half miles along the stream from Sharon Springs, and enters the Mohawk river, at which point the watershed area is about sixty-nine and one-half square miles.

Brimstone creek receives only the sewage of Sharon Springs and is not used as a source of public water supply.

At the recent conference at this Department with the village officials, it was stated that civil action had been commenced against the village by riparian owners on Brimstone creek for the recovery of damages to their property occasioned by the discharge of sewage into the stream.

I believe, from the evidence herewith reviewed as to the pollution of the stream and considering the deleterious effect of such pollution, that adequate treatment of the sewage should be required before its discharge into the stream. Undoubtedly, complete assurance against a condition of nuisance in the stream at any time and the consequent removal of all cause of action for damages to riparian rights now existing, can only be had by constructing the complete plant as shown by the plans or a plant effecting as much purification of sewage as would be accomplished by the said complete plant.

However, since the maximum summer population is reached for a period of three or four weeks only, and since a considerable reduction of suspended solids will take place in the septic tank through the agencies of sedimentation and liquefaction, I beg to recommend that the complete plans be approved and a permit issued allowing the discharge of effluent from the septic tank under the usual conditions with the further provision that the sprinkling filters and final settling basin shall be constructed and put in operation at any time when in the judgment of the State Commissioner of Health it shall be found that by reason of the condition of pollution of the stream such additional treatment of the sewage is necessary or desirable.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

PERMIT

Application having been duly made as provided by section 77 of chapter 49 of the Laws of 1909, constituting chapter 45 of the Consolidated Laws, permission is hereby given to the board of water and sewer commissioners of the village of Sharon Springs to discharge effluent from the septic tank, comprising a portion of the complete sewage disposal plant for which plans are approved this day into the waters of Brimstone creek at the point of outlet shown within the municipality of Sharon Springs in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of Brimstone creek or the unsatisfactory operation of the septic tank.
2. That the septic tank and dosing chambers with siphons shall be constructed in full conformity with the plans approved this day.
3. That whenever in the judgment of the State Commissioner of Health it shall be deemed necessary the sprinkling filters and final settling basin as shown by the approved plans shall be constructed and put in operation within the time then specified.
4. That the granting of this permit shall not be deemed to affect in any way action by this department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

ALEC H. SEYMOUR,
Acting State Commissioner of Health.

April 16, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Schoharie county.

SILVER BAY

SILVER BAY ASSOCIATION

On October 5, 1909, application was made for the approval of plans for a proposed sewage disposal plant for the Silver Bay Association at Silver bay on Lake George. On October 11, 1909, these plans were returned for revision. On October 19, 1909, they were resubmitted and were approved on October 26, 1909.

ALBANY, N. Y., *October* 11, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:—I beg to submit the following report on an examination of plans for a proposed sewage disposal plant for the Silver Bay Association at Silver Bay on Lake George, Warren county, submitted to this Department for approval on October 5, 1909.

Plans and documents comprise the following:

1. Tracing and blue print showing plan of buildings, sewers and sewage disposal plant.
2. Tracing and blue print showing disposal plant and adjacent topography.
3. Tracing and blue print showing plan and sections of septic tank.
4. Tracing and blue print showing plan and sections of sprinkling filters.
5. Report by the designing engineers.

The Silver Bay Association is a summer school which is open for about three months in the summer and has during this period a population of from 700 to 800 persons residing in hotel, dormitories and cottages.

The sewage from these buildings is to be collected by means of 6-inch and 8-inch vitrified tile sewers and the plans show that it is proposed to construct the upper portions of the sewer of 6-inch tiles laid on a slope of 0.5 per cent. and that the lower section is to be 8 inches in diameter with a slope of 1.12 per cent. and 0.5

per cent. The slope of the 6-inch sewer should be increased to at least 0.7 per cent. in order to produce self-cleansing velocities. This change can readily be made either by raising the upper end of the 6-inch sewer one foot or by lowering the lower end of this sewer one foot and thereby decreasing the slope of the adjoining section of the 8-inch sewer to about .62 per cent.

The plans also show that the proposed sewer is to be about 1,800 feet long and that it is to contain several curves and changes in alignment but the plans do not show any manholes. In order to facilitate cleaning and inspection, manholes should be placed at all points of change of slope and alignment and not more than 500 feet apart and the alignment of the sewer should be straight between the manholes.

The sewage is discharged by gravity into the septic tank through two submerged inlets. This tank is large enough to provide for from 6 hours to 8 hours detention of sewage from the present population.

From the septic tank the sewage is to pass into a dosing chamber from which it is discharged to the two sprinkling filters by means of two 6-inch alternating Miller siphons. The filter beds are to be filled with gravel to the depth of 3 feet and have an area of about 0.07 acres.

The distributing system consists of two main 8-inch castiron distributing pipes with 4-inch laterals about 11 feet on centers provided with 2-inch nozzles spaced about 7 feet on centers. Under each nozzle is to be placed a splash plate which, with a head of nearly 11 feet on the nozzles, should distribute the sewage over the entire surface of the filter. The bottom of the filter is provided with underdrains for collecting the effluent and conveying it to a settling basin.

It is stated in the engineer's report that the underdrains in the filters are to be "covered with a coating of gravel 6 inches thick screened through a ½ inch mesh, and above this 2½ feet of screened gravel screened through a ¼-inch mesh." This material will be too fine for sprinkling filters and a coarser gravel should be used so as to prevent clogging. The bottom layer should be composed of gravel or broken stone that will be retained on a one-inch ring and the top layer should be composed of material that will be retained on a ring ½-inch in diameter.

The settled effluent from the sprinkling filters is to be further treated by means of subsurface irrigation. The distributing system covers about 2 acres of land and consists of about 2,800 feet of open joint tiles laid just below the surface of the ground and surrounded with screened gravel. The elevation of the irrigation area is from two to three feet above the mean water level of the lake. It is, therefore, necessary to keep the ends of the distributing lines of tile about 50 feet from the high water level so as to prevent flooding the system during high water.

In view of the above, I beg to recommend that the plans be returned and that it be requested that they be revised before resubmission so as to arrange for the following features of design and construction:

1. That manholes be placed at all points of change of slope and alignment.
2. That the alignment of sewers be made straight between manholes.
3. That manholes shall be placed at intervals not more than 500 feet apart.
4. That the gravel or filtering material for the sprinkling filters shall be of such size as to be retained on a one-inch ring for the lower layer and not less than ½-inch material for the top layer.
5. That the ends of the laterals for the subsurface irrigation system shall be at least 50 feet back from the high water mark of the lake.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *October* 22, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to report that revised plans for the proposed sewage disposal plant for the Silver Bay Association at Silver Bay on Lake George, Warren county, were resubmitted to this Department for approval on October 19, 1909.

The sedimentation tank is divided into two compartments by a 3-inch plank partition. The inlet into each chamber is provided with a stop plank operated by hand so that either chamber can be worked separately or both chambers can be operated at the same time. Near the entrance to the sedimentation tank is a screen composed of ½-inch bars spaced one inch on centers. The capacity of the two compartments is about 3,700 gallons which is large enough to serve about 220 persons at the rate of 100 gallons per capita and give a detention of four hours.

The plans show an equalization tank between the sedimentation tank and the dosing chamber which is not to be constructed unless it is found necessary to equalize the flow from the dosing tank to the contact beds. It is proposed to have all the sewage exceeding a rate of 37,000 gallons per twenty-four hours flow from the sedimentation into the equalization tank from which it will be fed automatically into the dosing chamber at the same time that the dosing chamber is receiving sewage at the rate of 37,000 gallons per 24 hours.

From the dosing chamber the sewage is to be discharged to the contact beds of which there are three in number. The beds will be dosed in rotation and will remain in contact for one hour. The liquid is discharged on to the sand filter beds by means of automatic filled siphons. The contact beds are about five feet deep and are to be filled with broken stone. The plans show that the present area of the beds is to be about 0.0284 acres so that they will be required to treat settling tank effluent at the rate of 775,000 gallons per acre per day. This rate is somewhat high and is liable to produce clogging. It would, therefore, be advisable to enlarge the beds so as to treat sewage at the rate of 500,000 gallons per acre per day.

The sand filter beds shown are three in number and have an average total area of 0.0423 acres and will be required to treat contact bed effluent at the rate of 520,000 gallons per acre per day assuming a population of 220 persons using water at the rate of 100 gallons per capita per 24 hours, and it may be found after installation that these beds, owing to surface clogging, cannot be economically operated at such a high rate and that it will be necessary to increase the area of sand filters.

The effluent from the sand filters is collected by means of 4-inch and 6-inch underdrains and is discharged into a small stream tributary to Plum brook.

The plans show that provision is made for an ultimate installation of five contact beds and five sand filter beds of which each unit is to be twice as large as one of the present contact bed units and filter bed units. Provision is also made for doubling the size of the present proposed installation of sedimentation tank and dosing chamber.

Before passing upon the plans finally they should be submitted in duplicate and information should be secured on the following points:

1. The estimated future population to be served by the full plant as shown on plans in dotted lines.
2. The estimated daily sewage contribution per person.
3. The building or buildings to be served by the sewer to the south on general plan marked " 8″ vit. tile sewer about 290 feet from trap on soil pipe at house."
4. If plant marked "sewage disposal plant" on the general plans is to serve other buildings than those marked " Present Residence, Proposed New Building and Proposed Dairy."
5. If the sites marked "Proposed Disposal Plant B" and "Proposed Disposal Plant A" are to be used when new buildings are built in the future.

Except that the area of the contact beds as shown by the plans is somewhat small and should be enlarged before the plans are approved so as to be required to treat sewage at a maximum rate of about 500,000 gallons per acre per day, and except that some trouble may be experienced in the future when operating the sand filters at the high rate provided for, the disposal plant is carefully designed and should produce satisfactory results if properly constructed and operated.

As to the disposal of the final effluent from the plant, I would recommend that when resubmitted for final approval, the plans should show an effluent sewer from the "sewage disposal plant" leading to Plum Brook below all points at which it is proposed to take the water supply for the Protectory, such effluent sewer to be constructed before the proposed water supply system is installed.

I would, therefore, recommend that the plans be returned for correction as outlined in this report.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *May* 29, 1909.

EUGENE H. PORTER, M. D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— In the matter of plans for the proposed sewage disposal works for the Catholic Protectory at Somers Center, Westchester county, I beg to submit the following supplementary report.

Considerable additional information has been furnished in a second report submitted to this Department by the designing engineer which was not contained in his former report nor clearly shown upon the plans so that there is now sufficient data on hand to complete the examination of the plans.

It is stated in the supplementary report by the designing engineer that the population to be served at present by the proposed sewage disposal plant shown in full lines on the plans will probably not exceed 180 to 200 persons giving an average contribution of 20,000 gallons of sewage per day, and that the estimated future population of the institution will probably be from 800 to 1,000 persons. It is also stated in this report that " the proposed sewage disposal plant 'A' was designed to be built in the event the source of supply (water supply), marked 'A,' was used," and that the water supply " B " has been selected which takes the water from Plum brook above the outlet of the proposed disposal works. There was, however, nothing in the original report nor upon the plans to indicate which of the two water supplies it was proposed to use or that it was not the intention of the designer to use both of these supplies.

Assuming that the average contribution of sewage per day will not exceed 20,000, the contact beds, as planned, will be required to treat settling tank effluent at the rate of about 700,000 gallons per acre per day, which is still somewhat large. The result of this is to produce a quicker clogging of the beds and the more frequent cleaning or replacing of the material at the expense of labor. The same is true of the sand filters.

The designing engineer refers to the results obtained from the experiments on sewage purification at Columbus, which indicated that the safe rate of operating contact beds was found to be from 600,000 to 700,000 gallons per acre per day. Mr. George W. Fuller, however, who was one of the consulting engineers for the Columbus experiments, stated, in an article recently published in the *Engineering Record,* that "contact filters seem to be able to operate at a rate approximating about 500,000 gallons per acre per 24 hours." This is consistent with my rule of 100,000 gallons per acre per foot of depth between the limits of four and eight feet depth of filter.

In view of the above, and owing to the fact that the effluent from the disposal works is to discharge into a tributary of the Croton water supply, the more conservative rate of 500,000 gallons per acre per 24 hours should be provided for in the contact beds.

The proposed rate of 500,000 gallons per acre per day is somewhat high for sand filters treating contact bed effluent and there would be a tendency to clog owing to the suspended matter usually carried by such effluent.

I, therefore, recommend that the designing engineer be requested to follow the suggestion of our previous report of May 8th to so enlarge the contact beds and sand filters as to provide for two whole units of each instead of the proposed three half units.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *June* 14, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to report on an examination of plans for the proposed sewage disposal works for the Catholic Protectory at Somers Center, Westchester county, resubmitted to this Department for approval.

These plans are now resubmitted in duplicate and are revised in accordance with the recommendations embodied in the report dated May 29, 1909.

The size of the contact beds have been increased so as to include two whole units, equivalent to four half-units of the previous design, making the total area of the contact beds equal to 0.038 acres, so that they will now be required to treat settling tank effluent at the rate of about 526,000 gallons per acre per day, assuming an average contribution of sewage of 20,000 gallons per day. The size of the dosing chamber has been doubled so that one dose will fill one of the contact beds.

The sand filters have been enlarged to include two whole units having a combined average area of 0.053 acres. At an average contribution of 20,000 gallons of sewage per day, the sand filters will be required to treat contact bed effluent at the rate of 380,000 gallons per acre per twenty-four hours.

The disposal works, as shown on the plans submitted, if properly constructed and operated should produce a satisfactory effluent. I, therefore, recommend that the plans be approved and a permit be issued allowing the discharge, into a tributary of Plum brook, of effluent from the proposed disposal plant with the provision that when the contribution of sewage to the disposal plant shall exceed the 20,000 gallons per day for which the plant is designed, the extensions to the plant as shown upon the plans or such additional extensions as may be required shall be constructed.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

PERMIT

Application having been duly made as provided by section 76 of chapter 45 of the Consolidated Public Health Law, permission is hereby given to the New York Catholic Protectory to discharge effluent from the proposed sewage disposal plant at Somers Center into the waters of a branch of Plum creek at the point shown by the plans within the municipality of Somers in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of the stream into which the effluent is discharged, or the unsatisfactory operation of the sewage disposal plant.

2. That the sewer system and sewage disposal plant shall be fully constructed in complete conformity with the plans as approved.

3. That no surface or storm water from roofs, roads or other areas shall be admitted to the sewer system.

4. That when the contribution of sewage to the disposal plant shall exceed the 20,000 gallons per day for which the plant is designed, the extensions to the plant as shown upon the plans, or such additional extensions as may be required, shall be constructed.

5. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

June 15, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Westchester county.

TARRYTOWN

On April 2, 1909, plans were approved for sewers and sewage disposal works consisting of settling tanks and subsurface irrigation works for the disposal of sewage from buildings, on the property of Dr. C. C. Brace, which are located at too low an elevation to become tributary to the sewer system of the village of Tarrytown.

may be taken from the river or from Lake Ontario into which it discharges. Whereas, therefore, there may not be any especial need for a treatment of the sewage from this system at the present time, conditions may arise in the future that might make some means of purification necessary or desirable.

In view of the foregoing, I beg to recommend that these amended plans be approved and a permit issued to discharge the sewage of this district into Niagara river at the foot of Bouck street extended upon condition that the sewage tributary to this outlet shall be purified to such an extent and at such a time in the future as may be specified by the State Commissioner of Health.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

PERMIT

Application having been duly made as provided by section 77 of chapter 45 of the Consolidated Public Health Law, permission is hereby given to the board of public works of the city of Tonawanda to discharge sewage from the proposed sewers in the Gastown sewer district into the waters of the Niagara river at the foot of Bouck street extended within the municipality of Tonawanda, in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of the Niagara river.

2. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made to discharge additional sewage or effluent into the waters of this State.

3. That at such time in the future as may be specified by the State Commissioner of Health, plans satisfactory to this Department providing for sewage disposal works to purify all the sani-

tary sewage tributary to this outlet in such manner and to such a degree as may be required, accompanied by a proper application for the approval thereof, shall be submitted to this Department.

4. That whenever in the opinion of the State Commissioner of Health it is deemed necessary or desirable, any designated portion or all of said sewage disposal works shall be constructed within such time limit as may be specified.

EUGENE H. PORTER,
State Commissioner of Health

May 27, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Erie county.

WAMPSVILLE

MADISON COUNTY COURT-HOUSE AND JAIL

On November 4, 1908, application was received from the chairman of the building committee of the board of supervisors of Madison county for the approval of plans for a sewer and sewage disposal plant for the county court-house and jail located at Wampsville. These plans were returned for revision of the rather flat grade of the sewer. On March 8, 1909, the amended plans were submitted for approval. They were approved on March 13, 1909, and a permit was issued allowing the discharge of the effluent of the sand filter beds into a stream tributary to Cowaselon creek.

ALBANY, N. Y., *March* 12, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to report on the examination of plans for a sewer and sewage disposal plant for the Madison county court-house and jail located at Wampsville, Madison county, submitted to this Department for approval March 8, 1909.

The first set of plans submitted November 4, 1908, were satisfactory in general except for a rather flat grade for an 8-inch sewer. The plans were therefore returned with the suggestion that further study be made with a view of obtaining a better grade for the entire length by selecting another route or by placing the septic tank at an intermediate point along the line of sewer so as to arrange for a slope sufficient to produce self-cleansing velocity for the sewage up to the disposal plant in which case a flatter grade would be permissible for the effluent pipe. It had been previously determined that a 0.35 per cent. grade for the entire length of the sewer could not be obtained without embankment on property to which the county had no title.

After a further study by the designing engineer it was found that a 0.31 per cent. gradient for the entire sewer could be obtained by placing the septic tank at the head of the sewer in the vicinity of the buildings and that by locating the septic tank midway on the line of the sewer a grade of 0.35 per cent. could be obtained for the pipe carrying sewage and a grade of 0.10 per cent. for the effluent pipe. The Department recommended that the latter location be adopted. The plans, revised in accordance with the above recommendations, were resubmitted for approval March 8, 1909.

The plans under consideration consist of a duplicate set of tracings showing location of sewer and disposal plant as well as profile of sewer and details of septic tank and appurtenances.

The sewer comprises about 2,000 feet of 8-inch vitrified pipe having a 0.35 per cent. grade from the buildings to the septic tank and a 0.10 per cent grade from the septic tank to the filter bed located near the brook about 800 feet from the tank. The system is provided with a 2-inch flush pipe for cleaning.

The septic tank has a capacity of 7,500 gallons which is large enough to provide for an 18-hour detention on the assumption that there will be 100 persons to be served at 100 gallons per capita per day. The filter bed has an area of about one-tenth acre and is constructed of selected sand and gravel with 6-inch under drains. This disposal plant if properly operated should produce a non-putrescible effluent and is evidently of sufficient capacity for any probable demand that may be made upon it.

I, therefore, recommend that the plans be approved and a permit issued allowing the discharge of effluent into the brook tributary to Cowaselon creek.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

PERMIT

Application having been duly made as provided by section 77 of chapter 49 of the Laws of 1909, constituting chapter 45 of the Consolidated Laws, permission is hereby given to the board of supervisors of Madison county, to discharge effluent from the proposed sewage disposal plant to be built in connection with the sewer at the county buildings into the waters of a stream tributary to Cowaselon creek within the town of Lenox, Madison county, in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when, in the judgment of the State Commissioner of Health, such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of the stream into which the effluent is discharged or the unsatisfactory operation of the sewage disposal plant.
2. That both the sewer and the sewage disposal plant shall be constructed in full conformity with the plans approved this day.
3. That no storm or surface water shall be admitted to the proposed sewer.

ALEC H. SEYMOUR,

Acting State Commissioner of Health

March 13, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Madison county.

It is very essential that ultimate provisions be made for sewage purification in all inland cities, even though the installation of sewage disposal plants may not be required upon the immediate completion of the construction of a sewerage system or sewer extension, because sewage disposal must, of necessity, ultimately be required.

In view of the above facts, the plans for the western outfall sanitary trunk sewer have received the careful consideration of the Engineering Division.

The territory, comprising 1,600 or 2,000 acres of land, tributary to this trunk sewer, includes the western and southerly portions of the city and is at present thinly populated, a large part of the section not being laid out into city streets and building lots.

I find that the trunk sewer is adequate as to size, capacity and grade to satisfactorily meet any probable demands that may reasonably be made on it for a considerable period in the future, providing it is used as a strictly sanitary sewer.

In regard to the alternate plan for a combined storm and sanitary trunk sewer from Emmett street to the river, I beg to recommend that it be not approved as such, since the city has already commenced the separation of storm and domestic sewage in view of the need of future treatment of sewage, and since the storm water can be taken care of by the creek at a comparatively small expense.

Should the board of public works decide, however, to construct a separate storm water sewer from Emmett street to the river, I can see no objection to considering an application for permission to temporarily discharge domestic sewage into such sewer at Emmett street.

I, therefore, recommend that the plans for the sanitary trunk sewer be approved and a permit be issued for the discharge of sewage into the Black river with the general restriction applying to sanitary sewers, including provision for the preparation of plans for and the construction of such disposal works as may be necessary to effect the separation and treatment of the entire sanitary sewage of the city when required by this Department.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

PERMIT

Application having been duly made as provided by section 76 of the Public Health Law, as amended by chapter 468 of the Laws of 1903, permission is hereby given to board of public works of the city of Watertown to discharge sewage from the western sanitary trunk sewer into the waters of the Black river near the foot of Prospect avenue within the municipality of Watertown in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable or subject to modification or change at any time when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the existing pollution of the Black river.

2. That the above sewer shall be constructed in full conformity to the plans as approved and that no laterals or extensions discharging into said sewer shall be constructed until plans for the same shall have been approved by this Department.

3. That no surface or storm water from streets, roofs or other areas shall be admitted to the said sewer.

4. That the granting of this permit shall not be deemed to affect in any way action by this Department in the case of future applications that may be made for permission to discharge additional sewage into the water of this State.

5. That whenever required by the State Commissioner of Health complete plans for the separation and treatment of the entire sanitary sewage of the city shall be prepared and submitted to this Department for approval, and that, within the time limit stated in such requirement, the construction of any or all works shown by said plans as may be specified shall be completed.

ALEC H. SEYMOUR,
Acting State Commissioner of Health

January 11, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Jefferson county.

Haverstraw (Population 6,200)

On September 23, 1908, plans for additional sewers in the village were approved and a permit issued allowing the discharge of screened sewage into the Hudson river.

Peekskill (Population 13,200)

On April 10, 1908, plans were approved for sewers in Washington street and Sherman avenue and for a settling tank at Lents Cove to be used in connection with said sewers and a permit was issued allowing the effluent from this tank to be discharged into the Hudson river.

Highland Falls (Population 3,000)

On February 25, 1908, plans for sewerage and sewage disposal for the village, the plans showing two separate septic tanks, were approved and a permit issued allowing the discharge of the septic tank effluent into the Hudson river.

Cornwall (Population 2,000)

On February 25, 1908, plans for a sewer system, showing, as required by the Department, a screening plant were approved and a permit issued allowing the discharge of screened sewage into the Hudson river.

Matteawan (Population 5,600)

Settling tank and contact beds in operation constructed in accordance with amended plans approved July 25, 1906.

Kingston (Population 26,000)

Population of two wards, 3,000 persons, served by disposal plant consisting of settling tanks and contact beds.

There are other cases where sewage is discharged directly into the river along the lower Hudson, but in general such cases do not come under the provisions of chapter 468 of the Laws of 1903, or else such municipalities have not submitted plans for sewers in new or outlying districts.

In view of the action which has been taken in the above cases in this section of the State together with your policy to restrict the pollution of these waters in the future and the consequent desirability and necessity of making provisions for adequate sewage disposal in this case, it is my opinion that a separation of the sewage in this district is necessary and that adequate provision for methods of sewage disposal should be included in any approval which you may give to these plans.

In my opinion, this requirement for separation of sewage and provisions for sewage disposal need not necessarily entail any greater, and might entail less, expense than would be incurred by the general adoption of combined sewers. In fact, it is quite possible that some saving might be made through the adoption of a separate system which would go far toward if not completely providing for the construction of such disposal works as may from time to time become necessary.

Although the present population of this district is relatively small compared to the future population that may be expected, I believe it is consistently desirable and expedient to provide some method of treatment at once whereby the objectionable grosser solids may be prevented from discharging into the Hudson river, and until more complete works may become necessary.

The present population is estimated at not over 2,500 and for a number of years may not reach 5,000. Provisions for removing the grosser solids by a properly designed screening plant or a sedimentation tank of suitable dimensions would not cost much and they could be so designed as to be suitably extended in the future as the increase in population would from time to time make it necessary.

In view of the foregoing, therefore, I beg to recommend that the plans as now revised and presented for approval be approved and a permit be issued which shall include the following conditions:

1. That all sewers for the conveyance of sanitary sewage in the area tributary to the outfall tunnel sewer shall be constructed upon the separate plan, and that no storm or surface water shall be allowed to enter therein.

2. That plans for all sewers for conveyance of sanitary sewage in said area shall be submitted to and approved by the State Commissioner of Health before they are constructed.

3. That all sanitary sewage contributed to said outfall tunnel sewer through said sanitary sewers shall be suitably treated in an

efficient screening plant or settling tanks before it is discharged into said outfall tunnel sewer or the Hudson river, plans for which must be submitted to and approved by the State Commissioner of Health before any sewage is discharged into said sanitary sewers.

4. That whenever in the opinion of the State Commissioner of Health an extension of enlargement of said screening plant or of said settling tanks, or supplementary or additional treatment may become necessary, the city shall, upon due notice from the Commissioner, construct such extensions or additions with the time limit specified in said notice.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

ALBANY, N. Y., *August* 6, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report on my examination of amended plans for sewer and sewage disposal of the Nepperhan valley sewer district in the city of Yonkers which were recently submitted to you under date of July 27, 1909.

Plans for the relief of the Nepperhan valley district have been under consideration by this Department during the past year. The first plans which were designed were submitted April 14, 1909, and provided for a large tunnel under the divide between the Nepperhan valley and the Hudson river about on the line of Lake avenue which was to take the combined sewage and surplus storm water of the Nepperhan river and discharge this through this tunnel into the Hudson river. After many modifications and alterations in the plans, the proposed means for purifying this project was finally approved by you and a permit was issued for the discharge of sewage through this tunnel into the Hudson river upon certain restricted conditions on April 16, 1909.

It appears now that the authorities of the city of Yonkers have abandoned this tunnel project for the alleged reason of the uncertainty of the future requirements by the State for sewage disposal, and the large cost of the work involved. It was decided by them after careful consideration and study of the present local conditions to adopt an entirely new means of providing sewerage for the Nepperhan district along lines which would meet the requirements of the State Department of Health, and at the same time, not exceed a cost which is within the financial means of the city. Before submitting the present modified project for sewering the Nepperhan district, the city engineer has consulted with the Engineering Division on two occasions in order that the plans for the new project might be consistent with the general policy of the Department in regard to such matters as separation of sewage and the requirements for sewage disposal.

The plans now submitted consist of two duplicate sets of the following:

1. Plan of the Nepperhan valley sewer district from Lake avenue to upper city line.
2. Profiles of the main intercepting sewer and proposed screening plant for this sewer district.
3. Detailed plan of the pumping and screening chamber near Lake avenue.

According to the plans now submitted for your approval, the proposition is, to have a separate sanitary trunk sewer traversing the Nepperhan valley from the upper city line to Lake avenue to serve as an intercepter for the sanitary sewage of this district. At Lake street the grade of this intercepter is so low that it is impracticable to discharge all the sewage by gravity into the existing outfall storm sewer on Nepperhan avenue, this outfall having been constructed only up to Lake avenue. The sewage contributed by this proposed new intercepter sewer will then be treated to settlement and screening at Lake avenue and be discharged into the existing sewage system at Lake avenue and ultimately discharge into the Hudson river at the present outfall under the recreation pier.

The proposed method of treatment is to provide a settlement of the sewage equivalent to about an hour's detention, and successive screening by screens ranging in mesh from one inch to one-eighth inch. The amount of sewage which it is proposed to treat in the immediate future is equivalent to that from 10,000 people, although the ultimate capacity of the sewer above the screening plant is equivalent to some 30,000 people. The present population in this sewer district is estimated at 2,500 persons so that the provisions for future growth are suitably provided for as to the capacity of sewer and capacity of the settling and screening plant. It will, of course, be necessary to increase the capacity of the plant in the future, when the population exceeds 10,000 provided for, but the plans make provision for this extension when it becomes necessary.

I have carefully examined the plans in regard to grades, sizes, velocities, capacities and other hydraulic and sanitary features in connection with an intercepting sewer and find them sufficient to meet the future requirements of this district upon the basis of population used, and assuming that in the construction the sewers will be made sufficiently water-tight to prevent excess leakage. The plans for this trunk sewer provide for sanitary sewage only and it is understood and stated by the city engineer, in the development of all branch and lateral sewers which will discharge into this intercepter in the future, that additional plans for this shall be submitted and approved by this Department.

In regard to the method of disposal contemplated, namely, settlement of the sewage in chambers in a combined settling and screening chamber, it appears this proposed method is consistent with the requirements of the permit issued by you April 16th in regard to the reproposed tunnel to the Hudson river and I do not see any valid reason for objection to this method in connection with the new means and point of discharge of sewage into the Hudson river. This screening plan, will, of course, treat only the sewage from the Nepperhan district and not the sewage of the entire city, but such provision is consistent not only with the requirements of the Public Health Law in regard to increase of sewage from any municipality, but it is also consistent with the requirements demanded by you from other municipalities located on the lower Hudson, and also that of the city of Yonkers, as provided by you in a permit issued by you April 16, 1909.

In order to determine, however, the present sanitary condition of the Hudson river at the point where the main sewer, which will receive the proposed Nepperhan sewer, discharges into the river, I visited Yonkers and made an inspection on August 14th. I found that this main outfall sewer discharges into the river under the recreation pier recently constructed. This recreation pier is a two-deck pier, the upper portion used for recreation purposes and the lower as a dock, the Hudson day line steamer using the dock during the summer season. This outfall sewer, some five feet in diameter, is carried out and supported upon the pile bents of the pier and is composed of wooden staves, discharging openly into the last panel section of the pier. Owing to the timbering at the end of the pier, the flow from sewage infringes upon it and is deflected laterally, and flows generally up or down stream, according to the direction of the tide.

At the time of my inspection the stage of the tide was at about "high water," consequently the sewage discharge was spreading in both directions at end of pier, some of it settling about in the coves formed adjacent to pier and east shore of river. Grosser suspended sewage matters were plainly evident and although there was no odor detectable at the time, due partly to the wind carrying it off shore, the existing conditions were very unsightly and I am of the opinion that such conditions as I saw, which might occur at other times and under more adverse atmospheric conditions would cause offensive odors.

It is my opinion, therefore, that at some time in the future it will be necessary for the city of Yonkers to take steps to change the conditions at the outfall.

They could be materially improved by extending the outfall out into the Hudson and submerging the outlet, or carrying this sewer further south and discharging it into the river at some point further removed from this pier.

In view of the foregoing, I beg to recommend that the new plan and project as shown upon the plans now submitted, which were developed along lines consistent with the suggestions from this Department be approved by you, and that a permit be issued for the discharge of the settled and screened sewage of the Nepperhan district into the Hudson river through the existing outfall sewer of the city of Yonkers, which now discharges at the recreation pier, under the conditions closely consistent with those provided for in the permit issued by you April 16, 1909, in connection with the abandoned tunnel sewer route; but containing a provision that when, in the opinion of the State Commissioner of Health, the sanitary conditions surrounding the outfall of the main sewer at the recreation pier constitutes a nuisance, or are otherwise objectionable, the city shall, upon notice at once take steps to extend this outfall sewer further into the Hudson river, or to carry the outfall to a new and less objectionable point of discharge into the Hudson river, or to introduce such methods of screening, settling or more complete purification, as may at that time be required by the State Commissioner of Health.

Very respectfully,

THEODORE HORTON,

Chief Engineer

PERMIT

Application having been duly made to the State Commissioner of Health, as provided by section 77 of the Public Health Law, chapter 49 of the Laws of 1909, constituting chapter 45 of the Consolidated Laws, permission is hereby given to the board of public works of the ctiy of Yonkers to discharge effluent from the proposed Nepperhan valley sewage disposal plant at Lake street into the waters of the Hudson river at the recreation pier within the municipality of Yonkers in accordance with the plans accompanying the petition, under the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary or desirable by reason of the condition of pollution of the Hudson river.

2. That the proposed sewers, pumping station and sewage disposal plant shall be constructed in full conformity with the plans approved this day or such as may hereafter be approved by this Department; and that all the sewage to be collected by the proposed sewers shall be passed through the sewage disposal plant.

3. That no screenings, sludge or other suspended sewage matters which shall be collected, deposited or retained in any portion of the disposal works, shall be discharged into any stream or into

any sewer, but shall be disposed of separately by incineration, treatment on suitable sludge beds or by other approved means.

4. That all the sewers for the conveyance of sanitary sewage in the area tributary to the proposed intercepting sewer shall be constructed upon the separate plan, and that no storm or surface water shall be allowed to enter therein.

5. That plans for all sewers for the conveyance of sanitary sewage in said area shall be submitted to and approved by the State Commissioner of Health before they are constructed.

6. That whenever, in the opinion of the State Commissioner of Health, an extension or enlargement of the proposed settling or screening plant or supplementary or additional treatment may become necessary, the city shall, upon due notice from the Commissioner, construct such extensions or additions within the time limit specified in said notice.

7. That whenever, in the opinion of the State Commissioner of Health, it may become necessary, owing to the condition of pollution of the Hudson river to extend further from the shore of the Hudson river the present outfall sewer which now discharges at the end of the recreation pier, or to extend this outfall sewer along the shore of the river to a new and less objectionable point of discharge, and to provide submerged outlets; or to provide means for screening, settling or more complete purification of sewage in connection with this or other outfall sewers which discharge into the Hudson river, the city shall, upon due notice from the Commissioner, construct such extensions, alterations or additions within the time limit specified in said notice.

8. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

EUGENE H. PORTER,
State Commissioner of Health

August 19, 1909.

NOTE.— This permit to become operative must first be recorded in the county clerk's office of Westchester county.

INDIVIDUAL PERMITS ISSUED DURING 1909 UNDER SECTIONS 76 AND 78, CHAPTER 45, CONSOLIDATED LAWS (SECTIONS 75 AND 77, CHAPTER 468, LAWS OF 1903).

LOCATION	To whom issued	Date	Waste matter	Discharged into	Remarks
Brown Station	MacArthur Brothers Co. and Winston & Co.	Feb. 24	Effluent from sewage disposal wks	Esopus creek	See page 26.
Caughdenoy	Max Smith	Sept. 28	Effluent from sedimentation tank	A tributary of Oneida river	Only wastes to be discharged into the sedimentation basin shall be washings from the floors of the creamery and from cans and utensils, not including whey, milk or domestic sewage.
Chadwicks	Beckwith Leather Co.	Sept. 29	Soak and wash water	Sauquoit creek	Solid residues from the processes at the plant to be pumped to disposal area west of creek.
Ellery (town)	F. E. Armitage	Dec. 20	Effluent from sedimentation tank	Chautauqua lake.	
	S. D. Bates	May 26	"	" "	
	P. E. Brown	June 21	"	" "	
	E. W. Brownell	May 26	"	" "	
	O. C. Frisbee	May 26	"	" "	
	W. N. Gokey	June 14	"	" "	
	Minnie Hall	May 26	"	" "	
	Haskin & Thompson	May 26	"	" "	
	C. D. Hauk	May 26	"	" "	
	Amanda Lawton	June 21	"	" "	
	J. J. Lenhart	April 23	"	" "	
	Anales Lown	June 21	"	" "	
	L. N. Olmsted	Dec. 13	"	" "	
	S. E. Palmer	June 21	"	" "	
	George A. Phillips	June 21	"	" "	
	F. F. Pickard	May 26	"	" "	Cottage.
	F. F. Pickard	May 26	"	" "	Hotel.
	A. J. Pickard	May 26	"	" "	
	George Rappole	June 21	"	" "	
	Vellonia S. Rappole	June 21	"	" "	
	Nettie Romans	May 26	"	" "	
	John H. Secor	May 5	"	" "	
	Estella Walker	June 7	"	" "	
	J. B. White	May 3	Effluent from sewage disposal plants	" "	
	R. Belle Young	June 21	Effluent from sedimentation tanks.	" "	
Gowanda	Eastern Tanners Glue Co.	April 1	Refuse from glue factory	Cattaraugus creek.	
North Bangor (town of Bangor)	Franklin Co. Creamery and Condensed Milk Co.	Mar. 9	Cooling water and effluent from settling tank	Tributary to Little Salmon river	
Ogdensburg	Mrs. J. B. Kirkpatric	May 21	Sewage	Oswegatchie river	Location too low to be tributary to existing city sewer system.
Olean	Earle D. Holmes	June 14	"	Allegheny	Cannot become tributary to existing sewer system until intercepting sewer is constructed by the city

INDIVIDUAL PERMITS ISSUED DURING 1909 — (*Concluded*).

LOCATION	To whom issued	Date	Waste matter	Discharged into	Remarks
Oran (town of Pompey)	Hamilton Dairy Co.	Sept. 23	Effluent from settling tank	Limestone creek	
Pleasantville (town of Mt. Pleasant)	Hebrew Sheltering Guardian Society	May 5	Effluent from sewage disposal plant	Branch of the Saw Mill river	See also page 118.
Somers Center	New York Catholic Protectory	June 15	"	Branch of Plum creek	See also page 148.
River Forks (town of Brookfield)	Unadilla Forks Dairy Co.	Dec. 29	Waste water and washings	West Branch of Unadilla river	Permit does not allow the discharge into the stream of sewage, whey, milk or buttermilk.

GENERAL INVESTIGATIONS RELATING TO SEWERAGE AND SEWAGE DISPOSAL

In addition to the applications received for the examination of plans and the issuance of permits, many requests are made for special inspections, investigations or advice concerning sewerage systems now in use or about to be installed or are needed and these cases frequently entail visits and the preparations of reports. During the past year such investigations and reports have been prepared for the following places:

ALFRED

Request having been made by the local board of health that the Department make an investigation of insanitary conditions existing at Alfred, Allegany county, due to improper sewerage facilities, and to advise them in this matter, a representative of the Engineering Division visited Alfred on November 2, 1908. The findings of this investigation are discussed in the following report, a copy of which was sent to the village authorities on March 1, 1909:

ALBANY, N. Y., *February* 17, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to report on an investigation of the existing sanitary conditions in the village of Alfred, Allegany county, as was requested by Mr. F. A. Crumb, secretary of the local board of health, and Dr. G. E. Burdick of that village, in recent correspondence with the Department.

Mr. Henry W. Taylor, assistant engineer, visited the village of Alfred on November 2, 1908, conferred with Dr. Burdick and Mr. Crumb and others interested in the sanitary problems involved, and made an inspection of the central portion of the village with respect to the existing sewage facilities and the possibilities of their improvement.

The village of Alfred is located about ten miles south of the city of Hornell and lies in a valley tributary to Canacadea creek. The population of the village is estimated at about 1,000 inhabitants, and in addition thereto there is a transient population of about 600 pupils in the college located there.

The public water supply of Alfred is derived from springs about two miles from the village. This supply is, however, not exclusively used, and about one-quarter of the population in the center of the village still use driven wells for their water supply. These wells are from twenty to thirty feet deep.

It is estimated that there are some seventy-five privies in the central and most closely populated portion of the village. There are moreover several cesspools located in this same section, but the latter are chiefly below the location of wells serving any considerable number of people. The care of privies is apparently well attended to by the local board of health, and the night soil is taken from the privies regularly and buried about a mile out of the village. The pail system is required by the authorities of the village.

The soil in this vicinity is a very stiff and nonporous clay, with a slight admixture of gravel. As far as cesspools are concerned, it has proved itself to be impervious, and overflow soon occurs unless the cesspool is repeatedly cleaned. At present this overflow is directed to a small torrential stream — a tributary of Canacadea creek — which at the time of inspection was practically dry. It was stated that the observed conditions of flow obtained for the greater part of the year, and that only in the spring was there an appreciable volume of water to be counted upon.

The conditions in Alfred are typical of those which always exist in a small village that has just secured a public water supply, but has not as yet any adequate facilities for caring for the additional amount of sewage resulting therefrom. These usual conditions are, however, aggravated by the fact that the small stream can afford no opportunity for disposal by dilution for even a very small amount of sewage and the soil conditions which practically bar the construction of cesspools for a reasonably efficient operation under the ordinary care given to them. It was not believed, however, that at the time of inspection the existing conditions were, under the attention given them, positively dangerous to the community, but that they were indicative of the future dangers to public health bound to develop unless proper steps are taken to forestall them.

In conference with the above-mentioned gentlemen it was learned that the commissioners of the Cornell Agricultural Experiment Station or Farm, located about two miles below Alfred, were interested in a scheme to use the sewage of the village for irrigating purposes and that they would consider the disposal of all sewage delivered to the farm by the village. It also was stated that there were in the neighborhood of this farm gravel beds adequate to dispose of the sewage of the village for some years to come by land treatment, should it at any time not be needed for irrigating purposes by the experiment station.

It seemed apparent to the engineer that the sewage of the village must at any rate be delivered at a point about two miles below Alfred for the most economical means of disposal. There is ample fall of some thirty to forty feet per mile, according to the information obtained, and this figure seemed to be borne out by the inspection of the territory. It may be found that there are available sites nearer the village where settling tank treatment followed by treatment on sand filters or coarse grained filters might be employed.

However, surveys will be necessary in order that the most practicable plan may be determined upon and since the authorities of the college at Alfred are most deeply interested in the problem of disposing of sewage, it was stated that probably these surveys could be made by the college with little or no expense to the village. Also, Dr. Burdick thought that, rather than involve themselves in heavy expense for poor cesspools and makeshifts, many parties would be willing to subscribe to the expense of installing an outfall sewer to convey the sewage to the State farm or to a location where land treatment would be possible.

In view of the facts as ascertained during this inspection and the sentiment in the village already calling for better sewerage facilities, I therefore recommend that the local board be advised by the Department to take up the matter of surveys in definite form and submit plans for a sewer system and sewage disposal plant for the approval of this Department and the action of the citizens of the village.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

DANNEMORA

CLINTON PRISON

In accordance with the recommendations contained in the report of your Chief Engineer on November 13, 1908, of the investigation made by him of insanitary conditions in and below Dannemora resulting from the discharge of sewage from Clinton Prison, insane hospital and residences of Dannemora into certain small brooks traversing the village and town (see Twenty-ninth [1908] Annual Report, Vol. II, pp. 152–154), an appropriation for a sewage disposal plant for these institutions was secured from the Legislature by Hon. C. V. Collins, Superintendent of State Prisons.

In compliance with a request by Warden Cole of Clinton Prison for further advice in regard to methods and cost of sewage disposal, on September 2, 1909, Mr. Horton visited Dannemora and conferred with Mr. Cole. On September 3, 1909, he went over the ground of possible location for a sewage disposal plant and explained the probably best means for collecting and disposing of the sewage.

DEPOSIT

On January 21, 1909, Mr. A. S. Wickwire, president of the village of Deposit, called at the Department with reference to the sewerage system and sewage disposal plans approved by this Department (see Twenty-ninth [1908] Annual Report, Vol. II, pp. 17–18, 154–157), which were to be put to a vote of the taxpayers at an early date. He stated that the plans were assailed with a great many objections and criticisms by some taxpayers and requested that the Commissioner send a letter to him to be read at a public meeting to be held on January 25, 1910, for the purpose of explaining certain questions regarding sewerage systems and encouraging the taxpayers to vote favorably for it.

On January 22, 1909, the Commissioner accordingly addressed the following letter explaining the Department's position in the matter of requiring a separation of sewage from storm water.

ALBANY, N. Y., *January* 22, 1909.

MR. A. S. WICKWIRE, *Village President, Deposit, N. Y.:*

DEAR SIR: — Having been advised that the taxpayers of your village are about to vote upon the question of the sanitary improvements of the village by the construction of a system of sewerage and sewage disposal, I take this opportunity to express to you my views on this important matter which affects vitally the public health and welfare of your village, and to express my wish and desire that the citizens and taxpayers will vote unanimously to carry out this much-needed improvement.

The whole subject of sanitation and public health, and especially the more scientific branch of sanitary engineering, is so little understood by the ordinary lay mind that it is not surprising that at a time like this there may exist and be expressed misgivings and doubts as to the public necessity for a sewerage system and of the proposed design and construction. For this reason I wish to point out and explain some general features of the design and construction of sewerage systems about which these doubts are usually associated, and to explain the reasons why the present proposed plans for the village, which have been approved by the Department, should be accepted by this village and constructed without delay.

In the first place, there is quite frequently a misunderstanding on the part of many in regard to the relative sizes of pipes of a sanitary system and those of a storm-water system or a combined system of sewers. The purpose of the sanitary system is to provide for the removal of only domestic sewage and not of surface water, and for this reason the pipes need not be so large as those which remove storm or surface water; in fact, the sizes of sewers in a sanitary system bear a closer relation to the water supply mains, which, as you all know, are usually smaller, and, in the present case, considerably smaller than the proposed system of sewers. To be even more explicit, the sewage conveyed by the sanitary system is composed of, and derived exclusively from, this public water supply.

Another misconception or doubt frequently expressed among the uninformed is in regard to the necessity of a separation of this domestic sewage from the storm water, the mistaken opinion being that one system of pipes should serve both purposes and should, consequently, be more economical, whereas, on the contrary, this separation is very essential from a sanitary standpoint and is economical in both construction and maintenance of the system and disposal works. The sanitary reasons for this separation are the prevention of pollution of our streams whenever rain falls, at which time the storm water, if allowed to enter the sewers, would flush the sewers and overflow into and pollute the streams, and because any appreciable amounts of storm water would interfere with the satisfactory operation of the sewage disposal plant.

The economical reasons for this separation of sewage are:

1. That to take care of storm water the sewers would have to be many times larger than if the domestic sewage alone were taken care of.

2. That the construction of such large sewers in all of the streets of the village, which would be required in order to serve all house connections, would be relatively more costly than the construction of small sanitary sewers on all these streets for domestic sewage and the construction of only a few storm-water drains for surface water as these would be required.

3. The successful operation of sewage disposal works requires that the sewage shall be of relatively uniform strength and volume, and this would not be possible to secure if sewage and storm water were mixed.

4. Since the cost of sewage treatment is proportionate to the amount of liquid treated, it is evident that the addition of large quantities of storm water would increase largely the cost of operation of sewage disposal works.

5. Sanitary sewers must, in order to serve properly all house connections, be laid at a relatively greater depth than storm sewers, which can usually be laid near the surface of the ground, so that

the construction of large sewers at a greater depth would be relatively more costly than the construction of small sewers at such depths.

Although there are other reasons favorable to separation of storm water and sewage, I believe what has been said above is sufficient to show the desirability of this separation in general and why the policy of the State Department of Health has been, and will continue to be, that of requiring a complete separation wherever it is practicable.

In times like these criticisms are frequently made by those not competent to judge in regard to engineering details such as the location of disposal plants, the necessity for pumping, the provisions for protection against high water, etc. Such questions of such strictly scientific and engineering knowledge are hardly within the province of the ordinary lay mind to solve, nor can they be solved by any except competent engineers who make a specialty of the design of this class of engineering work.

The taxpayers of the village should not forget that the proposed plans for Deposit have been carefully examined by the engineering division of the State Department of Health; that they have been carefully reviewed in all details with respect to appropriate design; that the plans were not approved until this Department was satisfied that the design was an appropriate one; and that the construction, if carried out in accordance therewith, will meet the general requirements of sewerage for the village. The State Department of Health will make no guarantee as to any particular plans being the best that it is possible to design, but it is charged with the duty and must see to it that such plans presented for approval are in accordance with best modern practice, and must be assured before its approval is given that such plans will properly serve the purposes of adequate and efficient sewerage and sewage disposal.

There will possibly be a few taxpayers in the village who, prompted by a mercenary feeling and lack of public spirit, may argue that, because they are favorably situated in regard to their own individual disposal of wastes, they do not need a sewerage system, and will consequently refuse their support of this movement. Such citizens should not forget that this improvement of the village is a public health matter; that, regardless of their apparent particular benefits, they may be subject to any evil sanitary consequences in the way of a scourge or epidemic of disease; and that it is as much their duty to support this public improvement as if they were individually and immediately benefited thereby.

I believe, therefore, that in view of the pressing need for a system of sewerage and sewage disposal for the village in order to protect and conserve the public health and welfare of its citizens; of the creditable fact that the village authorities representing the taxpayers have realized this need and have had prepared plans for an appropriate system of sewerage and sewage disposal; of the fact that these plans have been examined in all their details by the engineering division of the State Department of Health, and that they have received the approval thereof, it is now the duty of the taxpayers of the village to lay aside all feeling of partisanship or party feeling and vote unanimously in favor of the construction of the sewerage system in accordance with these plans without delay.

Very respectfully,
EUGENE H. PORTER,
Commissioner of Health

On February 2, 1909, a letter was received from the village president informing the Department that the proposition to install a sewerage system was defeated on January 26, 1909, due largely to the fact that many houses and a hotel near the Delaware river and Butler creek have private drains discharging into those streams and stating that he believed that if this Department would order the persons so connected to cease pollution of the streams, that another election would bring about an entirely different result. In reply the following letter was sent to him:

ALBANY, N. Y., *February* 5, 1909.

MR. A. S. WICKWIRE, *Village President, Deposit, N. Y.:*

DEAR SIR:—I beg to acknowledge receipt of your letter of February 1st and regret very much to learn that the proposition to construct a sewerage system in Deposit was defeated by the taxpayers.

I note very carefully what you say in regard to the reasons why many of the taxpayers did not vote for this proposition and that the opposition came largely from the citizens who are now illegally provided with drains discharging into the Delaware river and the streams passing the village. This is certainly a very serious situation, and it is one which should be taken up co-operatively by your board of trustees and the local board of health in an effort to compel these illegal connections to be discontinued. Such a course would probably prove effectual in removing that element of opposition which has, as you state, been the primary cause for the defeat of the present proposition.

I am very desirous to help you in this matter of removing the pollution, but wish to point out the fact that the powers of the Health Commissioner are limited by the provisions of the Public Health Law. The Public Health Law is very explicit in conferring on the Commissioner the right, through the local boards of health, to prevent and remove pollution that has occurred since 1903 at the time of the passage of the act. It does not give him and the local health board the power to remove pollution which existed prior to that time, unless such pollution is per se a nuisance or can be proven to be a detriment to public health.

While, therefore, I desire to assist the authorities of your village in their fight against this pollution, you will readily see that my powers are somewhat restricted and that, although with this restricted power all of the pollution cannot be removed, I believe that a considerable portion of it might be removed under the existing provisions of the Public Health Law. I would suggest, therefore, as one of the most expedient courses for your boards of trustees and health to follow, would be to have the board of health make a canvass of all discharge of sewage into the streams and river that has been created since 1903.

Following such information you would be in a position to proceed under the provisions of the Health Law and compel the removal of this pollution. This would have an immediate benefit in not only improving the sanitary conditions of the village, but would go far toward the desirable end of securing the support of any such taxpayers thus concerned in voting for the sewerage proposition when the time comes for it to be again put to the vote of the people.

Trusting that you will have success along these lines and assuring you of my support, I am,

Very respectfully,
EUGENE H. PORTER,
Commissioner of Health

FORT EDWARD

On September 17, 1909, application was made by the village attorney for the approval of plans for certain sewer extensions. On November 5, 1909, these plans were disapproved and returned to the village authorities together with a copy of the following report covering the examination of these plans and setting forth the conditions and reasons why it is not expedient nor to the best interests of the village to approve them.

ALBANY, N. Y., *November* 5, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to report on an examination of plans for sewer extensions in the village of Fort Edward submitted in person by W. S. Bascom, village attorney and deputy village clerk, on September 17, 1909.

The plans were submitted in duplicate and were accompanied by profiles.

The proposed sewers are to be constructed in Burgoyne avenue, Prospect street, McIntyre street, Beverly Place and Bridge street. The extensions on Burgoyne avenue and Prospect street are to an existing sewer discharging into the Champlain canal, and are proposed to be constructed as separate sewers. The McIntyre street sewer as proposed is a storm water sewer with one or two house connections at present and is to discharge into the Champlain canal. The Beverly Place sewer as proposed is a separate sewer extension to a combined sewer discharging into a covered brook which flows into the feeder of the Champlain canal. The Bridge street sewer as proposed is a separate sewer discharging into the Hudson river. The plans are defective irrespective of the general design and the proposed points of discharge, in that the Burgoyne avenue sewer has no intermediate manhole for a section of about 960 feet and is an 8-inch sewer laid on a grade of 0.323 per cent. The Bridge street sewer has no intermediate manhole in a section 750 feet long.

In general, the individual sewers proposed conform in elevation and design to the plan for sewerage for the entire village approved on September 17, 1907, but in the matter of the proposed points of discharge of these sewers no adherence to the general plan for sewerage approved in 1907 is apparent in the design.

In this connection I would refer to Provision II of the permit issued by this Department on February 17, 1909, for the discharge of effluent from proposed sedimentation tanks at Bond creek and at Brown's lane, which states " that all sewers hereafter constructed in the village of Fort Edward shall conform with the plan for sewerage approved by this Department on September 17, 1907."

It will thus be seen that the provisions of this permit are not met in the design of the proposed sewer extensions submitted for approval.

Further, it is proposed to discharge the sewage to be collected by four of the sewers shown on the plans submitted into the Champlain canal or a feeder of said canal. This is in violation of a rule established by the State Department of Public Works which prohibits the discharge of sewage into the canals of the State.

In view of the above, I would recommend that the plans be not approved and that they be returned to the village authorities with the statement that when plans for sewer extensions in these streets are submitted in conformity with the general plan for sewerage approved in 1907, the approval of plans for such sewer extensions will be considered.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

FULTONVILLE

Complaint having been made to this Department of the need of sewerage in the village of Fultonville, Montgomery county, a member of the Engineering Division made an investigation of local conditions on June 1, 1908. A copy of his report (see Twenty-ninth [1908] Annual Report, Vol. II, pp. 162–164) was sent to the village board of trustees on June 25, 1908, and they were urged to take up without delay the preparation of a plan of sewerage and sewage disposal for that village.

On June 14, 1909, the Chief Engineer visited Fultonville at the request of the board of trustees. In the afternoon he drove over the village and discussed the sewerage situation with various members of the village government, giving general advice in the matter. In the evening he gave an address on the subject of sewerage and local conditions to a mass meeting which had been called for the purpose of general discussion of the question of issuing bonds for sewerage improvements to be voted upon on the following day by the taxpayers. His address was stated by the village authorities to have aided materially in carrying the proposition.

Plans for a sewer system and disposal plant were accordingly prepared and submitted to this Department for approval as stated elsewhere in this report see p. 59), being approved on October 2, 1909.

On November 25, 1909, request having been made by the village authorities for this Department to assist them in carrying another election on the sewerage proposition, the following letter was addressed to them:

ALBANY, N. Y., *November* 27, 1909.

Mr. J. A. CROSS, *Fultonville, N. Y.*:

DEAR SIR:— I beg to acknowledge receipt of your letter of November 25th and I am pleased to note that your village is about to vote again on the sewerage proposition.

I note carefully the various points raised by certain residents of your village, who do not seem to have either the interest or the intelligence to thoroughly understand and appreciate the nature of this great improvement. I note also the questions you ask concerning certain matters, and I am pleased to give you my views herewith concerning them.

I. Leakage in Dry Dock Brook from Canal

The argument that leakage from the canal into Dry dock creek affords sufficient flow to care for the sewerage is certainly a very weak one, since not only is this creek insufficient in size to assimilate and prevent a nuisance arising from sewage now discharged into it, but, as suggested by you in your letter, it is very doubtful whether this flow would be maintained as a result of future changes in the canal.

By far the weakest point in this argument is the fact that the question is one not of dilution or digestive capacity, but one of construction of the Health Law, which prohibits the pollution of any stream in this State without a permit from the State Commissioner of Health; and I can assure you, without meaning any offense, that, if those who are discharging sewage into this stream think that this can be continued with impunity, I can most surely correct such a notion. In fact, the Public Health Law gives the State Commissioner of Health power to order the local board of health to sever every connection with this stream if, in his judgment, such a course is necessary.

II. Adequacy of Design of Sewerage System

The system with its disposal plant has, as you know, not only been carefully examined by our Engineering Division, but many modifications and changes were made in it in order to bring the design up to the best standards in modern practice. The system of collecting mains has ample capacity to provide for not only the present population, but provision is made for a future growth in population a number of times greater than the present population.

As to the adequacy of the disposal works, the present plans provide for the present population, and the purification works would only have to be enlarged at intervals, by small increments, as the population grows, and consequently the burden of expense will be a small one distributed over future time. As to any provision for supplementary treatment, this as you know, cannot be determined in advance, since every permit issued in the State is subject to revocation and modification by the State Commissioner according to his opinion as to requirements of local conditions. While I cannot, therefore, make any statement as to what will be done in the future by the present Commissioner or any future Commissioner, I will say that I see no reason at the present time why any appreciable changes requiring more complete purification would be required in the near future. In fact, whenever that time does come, it is evident that the cost of supplementary treatment would be relatively slight as compared to the cost of the system, in view of the fact that the present tank would be a necessary and already constructed portion of such future and more complete treatment.

III. As to the Benefits Resulting from Introduction of Sewerage

I can most unqualifiedly state that the benefits derived from improved sewerage are a most important element in the future growth of municipalities. It is a factor that is rarely fully appreciated, and especially is this so during recent years when a great impetus has been given to the question of sanitation and where the public at large as a result of education along these lines in recent years have learned that a pure water supply and a sewerage system are absolute essentials to the health of their families. In fact, this Department receives very frequently letters from people, both within and without this State, asking whether certain places and localities are healthful places of abode, especially as to the question of pure water and sewerage.

IV. Consideration of the Outcome of the Approaching Election Concerning Sewerage of Fultonville

It is my understanding that the necessity for another election was due to some technical oversight concerning the separation of appropriations for improvements of streets and sewers. If this is so, and considering the fact that the taxpayers of the village have already expressed their intelligent opinion on this subject by voting favorably upon it at the last election, I certainly consider that it would be a very serious, disappointing and disheartening outlook for the good of the village of Fultonville if at the coming election the vote upon the sewerage proposition should result unfavorably. In fact, I can hardly believe that this will be the outcome, since the further the intelligent taxpayers study into this question of sewerage the more will become the necessity for it. There are always in a municipality taxpayers of the "obstructionist" type whose influence, biased by false economy and perhaps mistaken ideas, tries to stem the tide of an important and beneficial movement of this kind. I certainly hope that no such opposition will gain precedence at the time when so important a movement is to be passed upon by the voters.

Finally, I wish to add that, whereas this Department always stands ready to offer its best advice and influence without recourse to the effective measures provided by the Public Health Law to have necessary sanitary improvements introduced in municipalities, the trend of public legislation is more strongly to lodging additional powers with the State Commissioner of Health to compel these improvements; and that it may be truly expected in cases where villages show a voluntary spirit to provide sanitary improvements without recourse to the authoritative dictates of the State Department of Health, and a co-operative spirit with this Department, that more reasonable and considerate action may be expected from the Department.

I sincerely trust that at the coming election the voters will signify by their favorable vote a public-minded spirit and a full appreciation of the benefits from not only a sanitary but a business standpoint and the ultimate economy of constructing without delay the sewerage system according to the plans approved by this Department.

Very respectfully,
EUGENE H. PORTER,
Commissioner of Health

HAMBURG

On May 19, 1909, Mr. Horace F. Hunt, president of the board of trustees, and Mr. F. J. Blackmar, village attorney, of Hamburg, Erie county, called at the Department to discuss a proposition in regard to sewerage in that village. They stated that the proposition to construct a sewer system according to plans approved by this Department on September 10, 1908 (see Twenty-ninth [1908] Annual Report, Vol. II, pp. 38–40), was voted down by the taxpayers, and since the village was very much in need of surface drainage in one section of the village, in the vicinity of Hawkins avenue, they desired permission to construct a combined sewer for this section with free discharge into Eighteen Mile creek.

On May 28, 1909, this proposition for a combined sewer was disapproved, and in a letter addressed by the Commissioner to the president of the board of trustees, the village authorities were advised that:

" The proposition to construct a combined sewer into which sewage and storm water are to be discharged is certainly a step in the wrong direction on the grounds of economy as well as sanitation, and the policy of the Department, as frequently expressed, to stop the pollution of our streams would certainly not be conserved if permission were granted in this case. The sanitary sewage of the village must ultimately be purified, and when that time arrives it is very necessary that no storm water shall be mixed with it in order to economically and efficiently treat it, and for this reason it has been the further policy of the Department to require a separation of sewage in cases of all systems approved in the future except for the most cogent reasons.

" I, therefore, feel that I cannot approve this proposition to construct a combined sewer discharging into Eighteen Mile creek at the point suggested by you, and should recommend that, if the village wishes to secure drainage for the district in question, a storm water drain and not a combined sewer be constructed for this purpose."

HEMPSTEAD

The question of existing insanitary conditions of the village of Hempstead and the need of improved sewerage was referred to the Engineering Division on November 24, 1909 and in accordance with the request for advice the Chief Engineer visited Hempstead on December 15, 1910 and looked over the situation. In the afternoon, in company with several of the village officials, he drove over most of the streets in the village and inspected the pumping plant and well supply and the area on which it was alleged the Garden City authorities proposed to construct a disposal plant for purification of sewage, this location being just outside the village limits.

During this inspection and at a mass meeting held that evening, advice was given to the village authorities and citizens to the effect that the time has been reached in the development of the village when improvements relating to sewerage and sewage disposal should be taken up without delay. Suggestions were given in regard to the course for the village authorities to follow in having plans prepared for such improvements, and your Chief Engineer was informed that the proposition of preparing such plans would be considered at an early date. Up to the close of the year, however, these plans had not been presented to the Department.

HERMON

On April 15, 1909, application was made to this Department by Earl S. Taylor of Hermon, St. Lawrence county, for the issuance of a permit for the discharge of sewage from his dwelling into Elm creek. On May 21, 1909, this application to discharge crude sewage into Elm creek was denied, since Elm creek is tributary to the DeGrasse river, from which the village of Canton obtains its public water supply. Mr. Taylor was informed, however, that this Department would consider the granting of a permit if plans are submitted for the complete treatment of the sewage.

HERRING

On December 21, 1908, application was received from the Jefferson Power Company for the approval of plans for the reconstruction of a sewer at Herring, Jefferson county. On February 24, 1909, the proposition was disapproved as a matter of protection to the water supply of Watertown, as recommended in the following report, a copy of which was sent to the Jefferson Power Company, together with a sketch of a sedimentation basin recommended elsewhere in the State, and a letter suggesting that a plan similar to the one enclosed be prepared as showing preliminary treatment of the sewage, and that a design for a subsurface open jointed piping system or some form of filter bed (depending on the local conditions) be made up for disposing of or treating the effluent from the tank.

ALBANY, N. Y., *February* 19, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of an application for the construction of a sewer for a hotel located at Herring, Jefferson county, and owned by the Jefferson Power Company of Black river, N. Y.

The hamlet, called Herring, also owned by the Jefferson Power Company, is said to have a population of 200, and is located on the northerly side of the Black river about sixteen miles upstream from Watertown. The drinking water supply for both hotel and hamlet is derived from a well, located about twenty-five feet from the hotel building.

The hotel which was burned last fall and has been since rebuilt, has accommodations for an average of fifty persons with a maximum capacity of sixty-five. The old hotel discharged its sewage into a brook about 500 feet from the building. It is now proposed to lay about 1,000 feet of sewer and have the sewage discharge into the same brook, a few hundred feet below the old outlet and about 1,000 feet from the confluence of the brook and the Black river.

The hotel is located on a sandy knoll at an elevation of about thirty feet above the brook, high enough to afford ample facilities for the construction of a purification plant. Lower down in the valley of the brook the formation is said to be limestone, having but a thin covering of soil.

Owing to the fact that this place is located only sixteen miles above Watertown which takes its water supply from the Black river, employing filtration, and since the laws of 1903 prohibit any additional discharge of sewage into any of the waters of the State, except under permit, it would seem highly desirable, considering that such waters are used for drinking purposes, that the Jefferson Power Company be required to purify the sewage from the hotel before discharging into the brook tributary to the Black river.

I, therefore, recommend that the Jefferson Power Company be required to treat all the sewage from the hotel, and asked to submit plans for a disposal works to consist of a settling tank for preliminary treatment to be followed by subsurface irrigation or any other method of purification that will produce a satisfactory effluent.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

LOWVILLE

ALBANY, N. Y., *December* 9, 1909.

EUGENE H. PORTER, M.D., *Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report of an inspection of the sanitary conditions of the village of Lowville, Lewis county, made according to your instructions, several complaints having been received by the Department from residents of the village of alleged nuisances created by inadequate sewerage facilities.

The inspection was made by Assistant Engineer C. A. Holmquist, of the Engineering Division, accompanied by Mr. George Jeffries, member of the local board of health.

Lowville has a population of about 2,500 and is located on Mill creek two and one-half miles from its confluence with the Black river and about twenty miles above Carthage.

The village is provided with an adequate gravity water supply and although it has no public sewer system, it was stated that nearly three-fourths of the population sewer into brooks partly covered and partly open, all but one of which discharge into Mill creek. There are also several private sewers discharging directly into the creek.

Mill creek is a comparatively large stream which flows through the southern portion of the village from east to west. About 75 feet below State street at the south central part of the village, is a high dam constructed for the purpose of furnishing water power for a grist mill located on the bank of the stream. Below this point and for three-quarters of a mile the creek flows through a deep narrow gorge which reaches a depth of 75 feet at certain places. Towards the southeastern section of the village this gorge widens out to form a wide flat valley extending to the Black river.

The course of Mill creek was inspected through the village and there were found eight or more points of discharge for sewage into the creek, three above and five or six below the dam. Two or three of these sewers and drains receive sewage from one or two residences only but the remainder serve as sewers for a large portion of the village. The gorge also seemed to be a receptacle for garbage, ashes and other refuse giving an unsightly appearance to the banks.

A complaint was received by the Department of an alleged nuisance created by the discharge of sewage from one of the main drains into the mill pond above the dam. This drain or covered combined sewer had formerly discharged below the dam but had been diverted in order to furnish additional water power for the grist mill. The inspection showed that the point of discharge of this sewer had been changed back to its original position below the dam where it is less objectionable.

Another complaint was that of an alleged nuisance created by the discharge of sewage from about fifty families into a small brook which is partly covered and partly open. This little brook drains the northeastern portion of the village and receives the sewage from a large part of this section converting it into a sewage pollution stream or ditch, only a portion of which is covered below Trinity avenue.

At the time of inspection, the water in the creek was comparatively high owing to recent rains, thereby greatly diluting the sewage and this fact together with the prevalence of cold weather tended to reduce the nuisance to a minimum. Papers floating in the stream, however, and the discoloration of its waters gave evidence of gross pollution and the discharge of a large volume of sewage for the size of the stream.

The inspection showed, therefore, that at times, at least, a nuisance is created by the discharge of sewage into this brook and that during certain dry periods of the year this condition must be a source of annoyance to persons living near this stream below its intersection with Trinity avenue.

This nuisance should be abated either by stopping entirely the discharge of sewage into this brook and thus eliminating the insanitary conditions produced by such discharge or preferably by the construction of a public sewer system designed so as to care for the sanitary sewage that is now being discharged into this brook. Such a sewer system should be designed on the separate plan and should be comprehensive enough to ultimately provide sewerage facilities for the entire village.

The sanitary sewage could then be taken care of by this new sewer system and the present sewers, most of which are on the combined plan or a part of the natural drainage, could be used to care for storm water after the installation of a sanitary system.

I would suggest that in my opinion the most economical and, in fact, the necessary procedure for the village to follow would be to secure the services of a competent engineer to draw up plans for a complete sanitary sewer system. The expense to the village of having such plans prepared would be comparatively slight and certain portions of the system designed might then be constructed as necessary with the assurance that all sewers constructed under such plans would eventually form a part of a complete sewer system for the village. Under the provisions of the Public Health Law for the establishment of sewer systems in villages it is required that " such map and plan shall be comprehensive and shall cover all portions of the village, but the village may construct the whole of the said system or may temporarily omit any portions thereof until such portions may be necessary, subject to the approval of such omission by the State Commissioner of Health as hereinafter provided," etc.

It was learned during the inspection that certain sewers in the village have been constructed since 1903 in direct violation of section 76, chapter 45 of the Consolidated Laws (the Public Health Law) which provides that "no person, corporation or municipality, shall place or cause to be placed, or discharge or cause to be discharged into any of the waters of this state, unless the same shall have been permitted by the State Commissioner of Health, any sewage, etc." Further, the Public Health Law prohibits any increase in the discharge of sewage as well as the discharge of sewage from a sewer system which shall be extended, modified or reconstructed subsequently to the passage of the act.

In conclusion, I would say that the discharge of sewage into these small streams which at times are probably dry and the dumping of ashes, garbage and other refuse along the banks of Mill creek is an insanitary and objectionable practice and undoubtedly creates a nuisance that should be abated.

The ashes, garbage and refuse could be taken care of by arranging for regular collections and the disposal of the different materials in different ways, i. e., the ashes by filling, dumping or grading; the garbage by feeding to swine, burning or burying and the refuse by burning.

The more important question, however, is the proper care of the sewage which is now being discharged into these small brooks along their entire length within the village and which discharge creates the nuisance complained of to the Department. The proper and most effective solution of this problem is the installation of a comprehensive sewer system of adequate capacity to collect the entire sewage of the village and convey it to a suitable point of disposal below the village.

I, therefore, beg to recommend that this report be transmitted to the local board of health and that they be urged to relieve the existing conditions by the inauguration of systematic methods for the collection and disposal of ashes, garbage and refuse, and by the establishment of a comprehensive public sewer system.

If a sewer system is not installed in the near future for the purpose of abating the insanitary conditions existing along the streams in the village, the local board of health should proceed under the powers granted by sections 21, 26, 31 and 32 of chapter 45 of the Consolidated Laws (The Public Health Law) and require the abatement of any nuisances that are found to exist by reason of the discharge of sewage into these streams.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

On December 16, 1909, letters, enclosing copies of this report, were addressed to the village authorities urging them therein that active steps be taken at once to arrange for the preparation of plans for sewerage and sewage disposal and to start the construction of such complete sewer system by building sewers in certain portions of the village to relieve the insanitary conditions due to the discharge of sewage into the small streams and drains.

POINT O'WOODS

ALBANY, N. Y., *June* 29, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to report on an examination of plans for sewerage and sewage disposal for the summer resort on Great South beach known as Point O' Woods.

These plans were submitted for approval on March 11, 1909, by Mr. A. M. Ryon, engineer in charge of construction and who is also treasurer of the Point O' Woods Association. Accompanying the plans were reports describing in full the sewerage and water supply systems.

It was arranged when the plans were submitted for approval that an inspection of the plant would be made in June, the sewer system and sewage disposal plants as well as a public water supply system having been constructed in April, May and June, 1908, in order to comply with an ordinance of the board of health of the town of Brookhaven, which prohibited the discharge of sewage and wastes into Great South Bay. Prior to the installation of the sewer system a dry closet system was in use, the contents of the pails being dumped into Great South bay. Accordingly an inspection of the system of sewerage and sewage disposal was made by Assistant Engineer Cleveland on June 22d, and I beg to submit the following report on this investigation and an examination of the plans.

The resort is located on Great South beach about five miles east of the Fire Island light. The season is from June 1st to September 30th. There are about eighty cottages and three hotels and the maximum population is about 700.

The land is very flat so that the sewers were constructed on very flat grades of 0.5 per cent., the sewers being six inches in diameter.

- There are five independent systems of sewers and sewage disposal plants. The sewers are laid but slightly under the surface and many sections are laid in embankment. No manholes are provided at intersections or at changes of alignment, but since "Y" branch handholes are provided at intervals of 50 feet thereby giving unusual facilities for inspection and cleaning, it is believed that ample opportunity is afforded for removing stoppages in sewers which are more or less liable to occur in 6-inch sewers with such flat grades.

The five sewage disposal plants are located for the most part in comparatively isolated locations. Each plant consists of two circular septic tanks 5 to 6 feet in diameter and 4½ feet deep below the flow line giving a combined capacity of the two tanks sufficient for 6 to 8 hours detention, if the water consumption is assumed at 50 gallons per capita.

From these tanks the sewage is passed through 12 parallel lines of 6-inch sewer pipe, spaced 4 feet apart, laid with uncemented joints and placed on a grade of 2 inches per 100 feet 12 inches below the surface. By means of a suitable gate box, consisting of a vertical pipe with two vertical vanes on hinges, it is arranged that the effluent from the tanks on successive days will be diverted into different sets of subsoil pipe lines consisting of four lines in each set.

When the subsoil filters were constructed no underdrains were placed but during the past spring the four westerly beds have been underdrained by laying lines of 6-inch agricultural tile midway between and parallel with the distributing pipe lines — the top of the underdrains being placed 6 inches below the bottom of the distributing piping except in the case of the most westerly bed, this difference of elevation being but .1 foot. At this bed the ordinary ground water level is but 6 inches below the bottom of the underdrainage system and but 1.1 feet below the bottom of the distributing system. At the other four filters or subsoil piping areas the ordinary ground water level is 6 inches, 18 inches, 12 inches and 24 inches respectively below the bottom of the distributing pipe system.

The length of the parallel lines of subsoil piping varies from 50 to 75 feet and the total area of the subsoil piping beds is about 0.3 acres.

At 50 gallons per capita this would allow a rate of operation of 110,000 gallons per acre per day, which should, considering the quality of the sand, produce a well-purified effluent if all the beds had a sufficient depth of sand above the ground water level.

In review it should be noted:

(1) That effluent drains have been constructed from four of the beds which drain into the bay.

(2) That the effectual depth of filtering material owing to the relative height of the ground water, is insufficient for complete purification.

(3) That leased oyster beds, while they may not all be in use, lie in close proximity to the outlets of these effluent drains.

In view of the above, I would recommend that final approval be not given to the plans because of the possibility that sufficient protection is not afforded against contamination of the oyster beds, and since, although the present plan of sewerage and sewage disposal on account of the shortness of the operating season may serve for several years, or until the population at the resort has considerably increased, without creating conditions of nuisance, it cannot be considered a permanent means for caring for the sewage of the resort.

The final solution of the problem would probably involve a plan for collecting all sewage at one or more points and pumping the sewage thus collected to higher ground at the easterly extremity of the Association property where opportunity would be offered for locating filter beds at a sufficient elevation above ground water to provide complete purification of the sewage.

While the approval by this department of plans for water supply is not necessary and, therefore, no detailed investigation was made of the water supply installed at Point-o'-Woods during 1908, it is well to discuss in a general way the relation from a sanitary standpoint between the sewage and sewage disposal system and the water supply at the resort with especial reference to individual wells located between the filter beds and Great South Bay.

The public water supply is at present derived from three driven wells of 2-inch and 2½-inch pipe, and is driven through 16 feet of sand reaching from 10 feet to 11 feet into the ground water.

Formerly water was supplied each residence by driven wells located under the kitchens or near each house and these wells are still more or less in use since the distributing pipes of the public system are laid on the ground surface and the water is not as cold as from the individual wells.

One of the public wells is connected with a kerosene engine and the other two are connected with a windmill pump. It is intended to install another relay engine and connect this with a fourth driven well.

The wells are located 1,350 feet south of the bay and about 800 feet from the nearest subsoil piping area.

A series of test wells were driven during 1908 to determine the height of ground water at points between one of the nearest sewage filtering areas and the public wells. From the record of the observations made, furnished by the Association, it appears that the ground water flow during the period covered by the observations — September 17, to October 9, 1908 — was at all times in a direction from these wells, past the filter areas and towards the bay. It was stated by the Association authorities that the daily water consumption had decreased to but little below the maximum at the time of observing the lowest ground water level at a point near the wells — on September 28, 1908. At this time the flow of ground water was evidently away from the wells and toward the filter areas.

If this condition obtains at all times, as seems probable, it is certain that no danger will exist of contamination of the public water supply by the effluent from the filter areas, but careful observations should be carried on to determine the effect of the continued pumping on the ground water flow.

As respecting the individual wells located at the various hotels, residences and stores between the filter areas and the bay, since the ground water flow is from the filter areas toward the bay, these wells are all more or less subject to contamination and should be either abandoned or kept under close observation by means of frequent chemical and bacteriological analysis of their waters.

Further, wells for individual residences which are located near sewer lines should be abandoned or their waters frequently analyzed, since possible leakage from the sewers near such wells is more or less liable to cause contamination of their waters.

In conclusion I beg to call your attention to the prompt and earnest action taken by the Point-o' Woods Association to comply with the ordinance of the Board of Health of the Town of Brookhaven prohibiting the discharge of sewage into the bay. At considerable expense the sewer system and sewage disposal plants were installed in a very short time and except for the fact that the shallow depth of sand over the ground water table does not allow for as complete purification of the sewage as is necessary to guarantee at all times protection from contamination of shellfish grounds, the sewers and disposal plants have been well designed and constructed.

I would recommend that a communication be addressed to the Point-o' Woods Association calling attention to the points discussed in this report and to the need, at some future time, of a more effective and permanent method of sewage disposal.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

ALBANY, N. Y., *July* 1, 1909.

Mr. CHARLES W. HAND, *President, Point-o'-Woods Association,*
241 *Broadway, New York City:*

DEAR SIR:— I am enclosing a copy of a report of the Chief Engineer on an examination of plans for sewerage and sewage disposal for Point-o'-Woods, covering also an investigation of the system of sewers and sewage disposal.

In order to fully protect from contamination any shellfish grounds which might be affected, I have not given final approval of these plans, since, as is reviewed by the inclosed report, the permanent solution of the sewage disposal problem at Point-o'-Woods, on account of the shallow depth of sand over the ground water table will probably require the construction of an intercepting sewer and one or more pumping plants to convey all sewage to land at the eastern extremity of the association grounds, situated at sufficient elevation above ground water to admit of complete purification of the sewage.

I appreciate the work which your association has done, without going to this heavier expense, in caring for the sewage from the resort, and trust that eventually permanent arrangements for purification will be made.

I beg to call your attention to the discussion contained in the enclosed report as to the danger of contamination of well water supplies at individual houses located between the sewage filter beds and the bay or in close proximity to sewer lines which may be found to leak. I trust also that careful observations will be carried on as to the effective pumping from the present driven wells furnishing the public water supply as affecting the ground water flow, although, as appears evident from the enclosed report and from data furnished by your association, no immediate danger of contamination of the public water supply exists.

I am returning by way of American Express the duplicate sets of plans submitted to the Department.

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

PYRITES

On September 7, 1909, the board of health of the town of Canton ordered Mrs. E. May Grant Nicolette, owner of a hotel and double dwelling located in the unincorporated village of Pyrites, to remove the existing sewer pipes leading from the hotel and dwelling to the DeGrasse river.

On September 13, 1909, an application was made to this Department in behalf of Mrs. Nicolette, asking that a permit be granted allowing the discharge into the DeGrasse river of sewage from the above sewers. On October 4, 1909, this application was denied on the ground that the discharge of sewage into the river not far above the intake of the public water supply for the village of Canton would be prejudicial to the health of the residents of Canton.

ROME

STATE CUSTODIAL ASYLUM

Complaints having been received from time to time in regard to insanitary conditions surrounding the discharge of sewage from the Rome Custodial Asylum, and it having further been brought to the attention of the Department that cattle which were pastured in the vicinity of and below the point where this sewage is discharged died of symptoms suggestive of poisoning or other causes associated with drinking sewage pollution, an inspection was made of the conditions surrounding the discharge of sewage from this institution by the Chief Engineer on June 23, 1909. Copies of his report were sent to the superintendent of the institution and to the State Board of Charities, and they were urged to use their influence and take action to have the necessary plans for a disposal plant prepared and the construction of this plant completed and put in operation at the earliest possible time.

It is of interest to note in this connection that plans were prepared and submitted to this Department in accordance with the recommendations of this report and were approved on August 27, 1909 (see p. 134 of this volume).

ALBANY, N. Y., *June* 24, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I have the honor to report that in accordance with your direction I visited the Rome Custodial Asylum on June 23, 1909, and made an investigation of the conditions surrounding the discharge of sewage from the institution and of the progress that has been made toward the construction of a sewage purification plant, plans for which were approved by you on September 20, 1906.

It appears that the insanitary condition resulting from the discharge of sewage from this institution has been the subject of former investigations by this Department, and as a result of certain recommendations and the voluntary preparation of preliminary plans for sewage disposal by the Department, complete plans for a sewage disposal plant by sand filtration were prepared by the State Architect, were submitted to you and secured your final approval on September 20, 1909. It further appears that this disposal plant has never been constructed, and as a result of this omission the insanitary conditions which formerly occurred still exist in an aggravated form.

The total inmates of the institution, including attendants, now number about 1,200, and I was informed that it is proposed to increase this number at an early date. The sanitary sewage, together with a considerable amount of roof and other surface water, is collected in a system of combined sewers and lead through an outfall sewer running in a northerly direction to a small septic tank situated in an open field, possibly 2,000 feet from the institution.

A small portion only of the sewage was being passed through the tank, of about 10,000 gallons capacity, the remainder being by-passed around it. This raw sewage, together with the small quantity of effluent from the septic tank, was discharged into an open ditch which leads in a straight line, and at right angles to the railroad tracks, across field a distance of possibly one-half mile to the main line of the New York Central railroad. From this point the ditch leads northeasterly along said tracks a distance of approximately one and one-half miles to the old canal, into which it discharges, running near and parallel to the southwesterly city limits.

As stated above, a careful inspection of the conditions surrounding the discharge of this sewage at the pipe outlet and along this ditch was made on June 23. On that day I met Mr. Smith, warden of the institution (Dr. Bernstein being away on a visit), and in company with him and one of his assistants and Mr. H. W. Taylor, sanitary engineer to the State Architect (who was on that day at the institution collecting engineering data for plans for sewage disposal plant), I inspected the sewerage system, the outfall works and the ditch referred to from the sewer outlet pipe to its point of discharge into the old canal bed in the city of Rome.

It was found that the discharge of this practically raw sewage of the institution, which at the time of my inspection I estimated was 150,000 gallons or more, into this open ditch some two miles in length constituted a condition which in popular language can be described only as an open sewer and a nuisance. This open ditch between the point of sewer outlet and the railroad embankment, a distance of some one-half mile or more, receives so small an addition of fresh water from natural sources that the resultant dilution of the sewage is insignificant. At and below this point until it reaches the old canal bed the amount of fresh water added was probably equal to the volume of sewage, making the ratio of dilution equal to or a little greater than 1 to 1.

The sewage as it flows through the two-mile ditch changes considerably in quality, appearance and offensiveness. At the upper end where the sewage discharges openly the conditions are, as one would expect, characteristic of raw sewage, grey in color, highly turbid with suspended sewage matters, and for a distance of perhaps a mile the bed and banks were covered with a thick coating of sewage sludge. With the atmospheric conditions which prevailed at the time of my inspection, and owing to the exposed location of ditch and the well-maintained velocity of the sewage, the odors along the ditch except in the immediate vicinity of the pipe outlet were not generally offensive. At certain times, however, under unfavorable conditions of atmosphere the conditions along this ditch could not be otherwise than very offensive.

As to the effect of these insanitary conditions as affecting public health and public or private comfort some distinction must be made. There are no houses located anywhere near this ditch before it reaches the old canal. Below this point it passes in the vicinity of a number of residences in Rome, and, furthermore, it passes immediately along the railroad tracks for a distance of some one and one-half miles.

The land adjoining the ditch is very flat and there are numerous opportunities for the sewage during times of rain or high water to flood back onto the adjacent fields where land is cultivated and where cattle are pastured. This ditch is fenced on each side from the pipe outlet to the railroad tracks, while along the railroad track it is located within the railroad property, which is also provided with a fence. Usually these cattle do not have access to this ditch (except in the field of the institution where the septic tank is located, but which is not generally used for pasturing), but during times of high water the sewage has opportunity to flood back into the pastures and at these times cattle would have access to this diluted sewage and be subject to the dangers resulting from drinking it.

A very significant fact in this latter connection is that some five cows of the institution herd have died suddenly between the dates of May 26 and June 18 of this year and from the results of autopsies there is possibly a well founded suspicion that their death may be due to their drinking of sewage polluted water from the open ditch. Such a possibility is not remote since the polluted water so drunk might cause direct poisoning from poisonous chemicals or disease, such as anthrax tuberculosis or other germ diseases common to cattle and human beings.

It seems hardly necessary to discuss further the conditions which I found to exist at the institution at the time of my inspection. This discharge of raw sewage from some 1,200 persons openly into a ditch some two miles long, adjacent to land used for pasturing, flowing along in the vicinity of farms, railroad and residences, creates a condition that can be characterized only as a nuisance and a menace to health and life of human beings and cattle.

These insanitary conditions can and should be remedied by the construction of a proper sewage purification plant. Although plans have already been prepared and approved by you for such a disposal plant, I believe that, owing to the probable increase in the number of inmates and capacity of the institution and other engineering questions involved, such as a separation of sewage and surface water, it would be well to have the entire problem restudied and revised plans prepared and submitted for approval. If it can be economically done I believe it will be well to separate entirely and purify the sanitary sewage of the institution, and, owing to the insufficiency of volume of any available stream into which the effluent must be discharged, to provide a plant that will give a relatively high degree of purification.

I was informed by the warden and representative of the State Architect's office that an appropriation is now available for the construction of a disposal plant for the institution and that plans for the same are in preparation by the State Architect. In order, however, that the insanitary conditions which now exist at this institution may be corrected without delay, I recommend that a copy of this report be transmitted to the proper State or institutional authorities and that they be urged to secure the completion of the necessary plans and have carried out the construction of these purification works at the earliest possible time.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

SONYEA

CRAIG COLONY FOR EPILEPTICS

On June 9, 1909, request was made by Wm. T. Shanahan, M.D., acting medical superintendent, Craig Colony for Epileptics, for a representative from this Department to visit Sonyea to examine the institution sewage disposal plant with the view of making suggestions as to repairs and alterations which might be made within the limit of the appropriation available therefor. In compliance with this request, a member of the engineering division visited Sonyea on June 28, 1909, and submitted the following report, a copy of which was sent to the authorities of the institution:

ITHACA, N. Y., *June* 29, 1909.

MR. THEODORE HORTON, *Chief Engineer State Department of Health, Albany, N. Y.:*

DEAR SIR:— I have to report in accordance with your instructions: I visited on Monday, June 28th, the Craig Colony for Epileptics at Sonyea, and conferred with the Superintendent, Dr. Shanahan, in the matter of the sewage disposal beds for that institution.

I find the conditions to be as follows: There are about 1,300 patients and 200 nurses and others connected with the institution, and the superintendent estimates the water consumption at 125,000 gallons a day. Most of this water finds its way into the sewers, although it was said that some of the laundry water is discharged directly into an adjoining creek. The sewage from the different buildings is collected and carried in tile pipes to the screen chamber, flush tank, and filter beds, whence it is discharged through underdrains and a rain outfall into the Genesee river.

The beds are each one acre in extent, and are of different ages, the oldest one built eleven years ago, the next five and the third four. In this lapse of time, each bed, but particularly the oldest, have become clogged so that they fail to absorb the water readily, and it has been proposed to remove the upper position of the beds and replace with clean gravel. The appeal was made to you for advice as to the proper depth of gravel to remove, and for any other suggestions which might improve the general operation of the plant.

Assuming the flow at 125,000 gallons per day and the area of the filter beds at three acres, the rate of filtration is 41,667 gallons per acre per day. This is not an excessive rate for raw sewage, provided the sewage is normal domestic sewage, provided the beds are filled with suitable material, and provided they are properly operated. I was assured that the sewage contained no unusual substances, and with more than eighty gallons of water used per head per day, it is evidently not unusually concentrated. Before going into the beds, the sewage is screened through slat screws, apparently one-half inch clearance, so that no large substances, and no fibrous material operates to clog the surface.

As originally designed, the sewage was received from the screen chamber in a flush tank, operating automatically by means of a siphon pipe. This flush tank would hold about 2,500 gallons when full to its discharging level or about half an hour's flow during the period of average flow, but the superintendent stated that the siphon had not operated for at least five years.

The beds are filled with creek gravel without any screening and the material varies from the finest sand, mixed with clay, to cobble stones, five inches in diameter. On digging into the oldest bed, the top foot was found to be well compacted, to have the voids filled, and to be more like clay in appearance, except for the stones, than sand. Deeper than a foot the soil seemed to be somewhat more open, but even then far from being a satisfactory filter material. The other beds on being dug into were less compacted and more open. The surface of all the beds was uneven and with serious differences in level throughout each bed, disregarding the uneveness caused by stones of from two to five inches diameter scattered all over the surface.

The sewage is discharged on to the beds through two openings on one side each controlled by a valve on the branch which leads out from the main carrier.

After conferring with the superintendent, inspecting the beds, and carefully considering the conditions, I am led to the following conclusions:

1. That the chief cause of the difficulty lies in the unsuitable material used in the beds. Taken directly from the creek without screening, it contains lumps of clay as well as large stones and lacks the first essential of suitable filter material, viz. uniformity of size of grain.

2. That since the surface layers in beds Nos. 2 and 3 are not perceptibly clogged, it will not improve the capacity of those beds to change the surface layers.

3. That since the surface layer in bed No. 1, is plainly clogged, its capacity may be improved by removing from twelve to fifteen inches and replacing with fine screened gravel.

4. That all the beds should be carefully leveled and smoothed.

5. That a better distribution will be obtained by building two

troughs to carry the sewage from the sides where it is not delivered out onto the beds.

6. That a greater capacity can be obtained by repairing the siphon so as to operate the intermittent flush tank.

7. That inasmuch as only $1,000 is available for immediate improvements, the suggestions embodied in the third, fourth, fifth and sixth conclusions just stated are all that can be done at present but that proper measures should be taken looking towards emptying all of the beds and replacing with sand or fine gravel, screened and properly washed.

Respectfully submitted,
H. N. OGDEN,
Special Assistant Engineer

TICONDEROGA

On May 24, 1909, a request was received from the board of trustees of the village of Ticonderoga to send a representative to that village to suggest plans for the beginning of a sewerage system that would be approved by this Department. On June 5, 1909, an application was received from the village authorities for the approval of a proposition to construct a sewer in property near West Exchange street. On June 25, 1909, an examination of sewerage conditions was made by members of the engineering division who recommended in his report that sewer extensions in the village of Ticonderoga should be carried on along permanent comprehensive lines. On July 6, 1909 a copy of this report was sent to the president of the board of trustees and to the president of the board of health, and the application of June 5, 1909, was denied. Later an engineer was engaged by the village to draw up plans along the lines recommended.

The report was as follows:

ALBANY, N. Y., *June* 30, 1909.

MR. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— I beg to report on an examination of sewerage conditions in the village of Ticonderoga made on June 25th.

The inspection was made in response to a request from the village authorities, an application having been received at this Department on June 5th for approval of a proposition to construct a sewer across the Dolbeck property on West Exchange street, thence across Wiley street to Ticonderoga creek, the purpose of this sewer being to afford an outlet for a pool of stagnant water existing on the grounds of the Flint estate on West Exchange street.

This proposition was recommended by the board of health to the board of trustees of the village of Ticonderoga, duly certified by the board of trustees and forwarded to the Commissioner of Health for his approval in accordance with the provisions of section 21 of the Public Health Law. It was stated in the application that extremely insanitary conditions were created near the Dolbeck property by reason of the existence of a pool of stagnant water and that immediate relief was needed.

In company with Dr. George H. Beers, health officer; Mr. T. E. Harvey, village president; Mr. C. E. McNeal, trustee; Messrs. H. W. Treadway and M. J. Wilcox, members of the village board of health, and Dr. George W. Knapp, health officer of the town of Ticonderoga, an inspection was made of the premises described above as well as other sections of the village where the insanitary method of disposing of sewage now in vogue in the village creates almost intolerable conditions.

It was found that in a ravine which lies parallel with West Exchange street in the northwesterly section of the village, private sewers from twenty-five or thirty houses situated on West Exchange street, Prospect street and along the north side of the ravine, now discharge, and that the excess flow from this ravine not passing through a blind drain to the creek reaches the premises of the Flint estate, especially in time of storm, and creates a pool of stagnant, sewage-polluted water thirty feet or more in diameter.

The conditions at this point were especially insanitary and arrangements should be made by the village as soon as possible to abate the nuisance thus created.

Inspection in various portions of the village disclosed the same or worse conditions as to insanitary methods of disposing of sewage as were described in my report to you under date of January 6, 1906, appearing on page 776 of the annual report for 1906, and further alluded to in the report of a second inspection in the village of Ticonderoga appearing on page 240 of the annual report of the Department for 1907.

The members of the village board of health, as well as the members of the board of trustees, stated that complaints were continually received of the nuisances caused by the method of disposing of sewage in the village, which consisted in a great many instances in discharging sewage into ravines or natural watercourses where it flows partly in closed conduits or in pipes and partly in open ditches until it reaches Ticonderoga creek.

These conditions have been reviewed before and the village has been urged to cause a plan for a sanitary sewer system covering the entire village to be prepared and approved by this Department, whereupon such sewers as are urgently needed may be constructed under the provisions of the Village Law with the assurance that all sewers so constructed will form a portion of a permanent comprehensive sewer system for the entire village.

In view of the fact that the present incomplete sewering of the village is entirely inadequate and that the construction of the sewer, for which approval is asked in the application, will simply retard a movement for sewer construction in the village along permanent and satisfactory lines, I beg to recommend that the application be denied and that the board of trustees be urged to have prepared a comprehensive sewer plan which shall provide an adequate system of sewerage and shall show means for eventual treatment of the sewage before its discharge into Ticonderoga creek.

As respecting the urgent need which exists for relief from insanitary conditions now existing near the Dolbeck property, it was suggested to the board of trustees that, as soon as sufficient work had been done in the preparation of a complete sewerage plan so that plans for a sewer in this district might be drawn up with the assurance that such plans would form a part of the complete system, application for the construction of such a sewer might be made to the Department, accompanied by an application for the issuance of a permit allowing the temporary discharge into Ticonderoga creek of sewage to be collected by such sewer.

I would, therefore, recommend that the village trustees be communicated with and urged to take up the matter of adequate sewerage along the lines suggested above.

Incidental to this investigation it was learned that in April, 1908, a proposition was submitted to the taxpayers of the village as to whether or not the Chilson Hill water supply system should be extended to Goose Neck pond. Detailed discussions of this proposition may be found in the annual reports of the Department referred to above. The proposition to extend the Chilson Hill system was carried by a small majority, but since the plan of the village was to issue bonds for a maximum term of fifty years, and since after the vote on the extension of the water supply system had been taken it was found that the legal life of bonds could not exceed thirty years and that the first bonds of the issue must be met in five years, the trustees abandoned the projected extension of the water supply on the grounds that the original bonds for the Chilson Hill water supply were maturing and were as great a burden as the village could at present assume.

The insanitary conditions and the menace to the purity of the public water supply by reason of the possibility of infection from drainage reaching the outlet of Lake George above the intake to the Lake George water supply system of the village still exists, therefore, as for several years in the past.

No considerable typhoid has appeared in the village during the past two years, but previous to this period typhoid cases were more or less present.

It is believed that the installation of a sewer system, if the sewers are extended to the vicinity of the Lake George intake, will materially lessen the danger of infection of the water supply, and I would suggest that this latter consideration be pointed out to the village authorities in connection with the evident need for sewerage in other sections of the village.

Respectfully submitted,

H. B. CLEVELAND,

Principal Assistant Engineer

WATERVILLE

Request having been made by the president of the local board of health of the village of Waterville, Oneida county, that a representative from this Department make an investigation of insanitary conditions along the streams in that village resulting from the discharge of sewage therein, a member of the Engineering Division visited Waterville on November 24, 1909. His findings are discussed in the following report, copies of which were sent on December 16, 1909, to the local board of health and board of trustees, together with letters calling attention to the urgent need of sewerage in the village and asking them to take steps to provide for the installation of a modern sewerage system for the village.

ALBANY, N. Y., *November 29, 1909.*

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report on an inspection of sanitary conditions in the village of Waterville, Oneida county, made according to your instructions and at the request of Dr. T. Z. Jones, president of the local board of health.

Dr. Jones stated in his letter to the Department that complaints had been received by the local board of the discharge of sewage from private sewers and of the discharge of sewage and chemicals from a knitting mill into a stream that runs through the village, etc.

The inspection was made on November 24, 1909, by Assistant Engineer C. A. Holmquist, of the Engineering Division, accompanied by the president of the board of health.

Waterville has a population of about 1,500 persons and is located on Big creek, a tributary of Oriskany creek and the Mohawk river, about 24 miles southwest of Utica. The village is provided with a public water supply and although it has no public sewer system it was stated that nearly one-half of the entire population is provided with private sewers which discharge into Big creek, a small stream, which runs through the central portion of the village from south to north and also into a small tributary of Big creek which flows through the east central section of the village and discharges into Big creek near Main street.

An inspection was made of the portions of the streams which flow through the built-up section of the village with a view of determining, of possible, the extent of the pollution. There was a marked evidence of pollution of Big creek especially below its confluence with the small brook which flows through the village from east to west. The water in this stream was black from the discharge of dyes and chemicals from the Oneida Hosiery Company, located about one-half mile up stream. This discoloration was, however, almost imperceptible one-half mile below its confluence with Big creek.

No objectionable odors were noticed along the banks of the creek at the time of the inspection. This was probably due to the cold weather and the comparatively large amount of water in the creek resulting from the recent rains as it was stated by Dr. Jones that, during certain warm and dry periods of the year, disagreeable odors from the streams were complained of by the people living near the banks of these streams. Another objectionable feature seemed to be the dumping of ashes, garbage and refuse along the course of the streams, especially from the business section of the village.

The course of the brook was inspected from its confluence with Big creek to a point above the outlet sewer from the knitting mill and inspections at different points showed that, although the water was highly discolored and the stones in the bottom of the stream were covered with a dark precipitate no objectionable odors were given off below a point about 200 feet from the outlet of the sewer from the knitting mill. From this point an odor of sulphureted hydrogen was noticed but disappeared entirely at and near the mouth of the sewer. It was stated that this odor was complained of by the residents along the brook during low water periods in the summer.

Through an inspection of the Oneida Hosiery Company it was learned that about 60 persons were employed at the mill and that about 500 pairs of cotton hosiery are knitted per day and that about 1,000 pairs are dyed and finished. In the process of bleaching and dyeing varying quantities of chloride of lime, sulphuric acid, sodium sulphide and mineral dyes are used. The black dyes, which predominate, give rise to the discoloration of the water in the brook. The domestic sewage from the employees is discharged into the brook together with the industrial wastes.

This mill has been in operation since November, 1906, and has no permit allowing the discharge of wastes into the waters of this State and is therefore violating section 78 of chapter 45 of the Consolidated Laws (Public Health Law).

It was also stated by the president of the board of health that the Kirkland Canning Company, located just west of the corporation line did, until last summer, create a nuisance by the discharge of wastes into the brook through a sewer emptying into the stream within the corporation limits. This plant was not in operation this year so that no complaint was received against it by the local board of health during the past season, but it is expected to operate again next year. Inasmuch as this plant was discharging wastes into the brook prior to the passage of chapter 468 of the Public Health Law of 1903 the nuisance alleged to be created by the canning factory can be abated either under the general provision of the Public Health Law for the removal of nuisances or better by the establishment of a public sewer system to care for sewage and industrial wastes.

It was further stated that Borden's Condensed Milk Company plant located in the village discharged large quantities of whey into Big creek creating an unbearable nuisance during the summer of 1908, and that the local board had difficulty in stopping this discharge since the representatives of the milk company stated that they were discharging wastes under provisions of a permit issued to the Borden's Condensed Milk Co. by the State Department of Health.

The records of the Department show that a permit was issued to the milk company on February 25, 1907, a copy of which should be on file in the office of the local board of health, under the following conditions:

" This permit is for the discharge of waste water and washings only, and does not include sewage or whey; and is revocable at any time when in the judgment of the State Commissioner of Health, the waste matter being discharged into the stream causes a perceptible pollution of the stream."

The discharge of whey and sewage into this stream is most objectionable inasmuch as the dam under Main street backs up the water and forms a stagnant pond at or near the center of the business section of the village and it was stated that the insanitary conditions created thereby are aggravated at times when there is little or no water in Big creek above the dam.

I would, therefore, recommend, that the local board of health be advised to enforce the provisions of this permit in the case of any future discharge of whey into the waters of this State by the Borden's Condensed Milk Company, or on notification of the local board of health of the recurrence of and discharge, the permit be revoked.

In view of the above, I would conclude that the discharge of sewage from private sewers and the discharge of industrial wastes into the streams which flow through the village and the dumping of ashes, garbage and other refuse along the banks of and into these streams do, at least at times, create a nuisance and should be discontinued.

The ashes, garbage and refuse could be taken care of by installing regular collections and disposing of the different materials in different ways, i. e., the ashes by filling, dumping or grading; the garbage by feeding to swine, burning or burying and the refuse by burning.

The more important question, however, is the proper care of the sewage and industrial wastes which are now being discharged into these small streams along their entire length within the village and which discharge creates the nuisances complained of. The proper and most effective solution of this problem is the installation of a comprehensive sewer system of adequate capacity to collect the entire sewage of the village and convey it to a suitable point of disposal below the village.

I, therefore, beg to recommend that this report be transmitted to the local board of health and that they be urged to relieve the existing conditions by the inauguration of systematic methods for the collection and disposal of ashes, garbage and refuse, and by the establishment of a comprehensive public sewer system.

If a sewer system is not installed in the near future for the purpose of abating the insanitary conditions existing along the streams in the village, the local board of health should proceed under the powers granted by sections 21, 26, 31, 32 and 76-85 inclusive of chapter 45 of the Consolidated Laws (the Public Health Law), and require the abatement of any nuisances that are found to exist by reason of the discharge of sewage or industrial wastes into these streams.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

In addition to the foregoing, correspondence was had with and advice was given in matters relating to sewerage and sewage disposal at the following places:

Albion (House of Refuge)
Belmont
Freeport
Glen Cove
Riverhead
Sharon Springs
Spring Valley
Waterloo

PROTECTION OF PUBLIC WATER SUPPLIES

GENERAL EXAMINATION OF PUBLIC WATER SUPPLIES

Although the Public Health Law provides for a partial control over the public water supplies of the State through the enactment and enforcement of suitable rules and regulations formulated by the State Commissioner of Health when application is made by the local board or water company having control over these supplies, the Department, through its Engineering Division, is called upon to perform many active duties, engage in many investigations and render much advice in many reports concerning present and proposed water supplies throughout the State.

The need for these investigations and for a consideration of the questions at issue has been brought about in some cases by the necessity of seeking a new source of water supply or by the desirability of improving the condition of the intake, or the distribution system or of some other undesirable feature of the water supply and in other cases has arisen from some unusual prevalence of typhoid fever or other intestinal disease or from the existence of conditions that threatened the sanitary quality of the water. All such special requests are followed by an investigation, if the conditions require a field examination, and the report of the investigation or a letter of advice in the matter is transmitted to the local authorities.

Such investigations have been made and reported upon during 1909 for the following places:

BINGHAMTON STATE HOSPITAL

ALBANY, N. Y., *March* 3, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:—I beg to submit the following report of an investigation made under your instructions and in accordance with the application of Hon. F. B. Ware, acting under the provisions of section 13a, article I, of the Public Health Law, for the approval of preliminary plans for securing an additional water supply for the State Hospital at Binghamton.

On February 19, 1909, Mr. C. F. Breitzke, assistant engineer of this Department, visited Binghamton and, accompanied by representatives from the State Hospital, he went over the ground and made an examination into the sanitary conditions surrounding the proposed water supply. He collected samples of water from one of the new driven wells, which were received on that same day at the State Hygienic Laboratory for analysis.

The Binghamton State Hospital is located in the eastern limits of the City of Binghamton on a hill at the edge of the Susquehanna River. It has from 2,700 to 3,000 inmates, officials and employees.

Its water supply is obtained from wells and from the Susquehanna river at a point about a quarter of a mile south of the main building. The water works were installed about twenty-five years ago and consist of a collecting well supplied from artesian wells and from the Susquehanna river, a pumping plant, one equalizing reservoir, and about a half mile of 6 and 8-inch pipe. The average daily consumption is estimated at 750,000 gallons and is supplied at the main building at an average pressure of sixteen pounds per square inch.

The collecting well is an underground structure 120 feet long, having a rectangular section 9 feet wide and 23 feet deep, constructed with rubble masonry walls and covered over with a brick arch, with the exception of 15 feet of its length which is covered by a building having a removable plank flooring giving access to the well. Along the bottom of this well there are ten 6-inch driven wells 12 feet deep, one 6-inch well 90 feet deep, and two dug wells 4 feet in diameter and 12 feet deep. A 6-inch pipe near the bottom and provided with a valve admits water from the Susquehanna river.

The collecting well was excavated in about 10 feet of ashes and cinders and then through a layer of loamy clay down to the gravel layer. This gravel layer is about 12 feet thick and is underlain by a thick layer of clay. The well driven to the depth of 90 feet penetrated a second gravel layer, conveying a saline water about one-tenth the strength of sea water. An analysis of water taken from this well on June 2, 1906, and made by Mr. B. E. Nelson, chemist, Binghamton, gave the following results expressed in parts per million:

Total solids	3.360
Nitrogen as free ammonia	0.010
as alb. ammonia	0.025
as nitrates	10.60
as nitrites	0
Chlorine	1947.0
Alkalinity	145.0
Bacteria per c.c	15
Gas formation	0

The water stands in the collecting well to a depth of four feet and at about the same level as the water in the Susquehanna river about 140 feet distant. The water is pumped into the mains and reservoir from this well, the suction pipes coming to about a foot from the bottom.

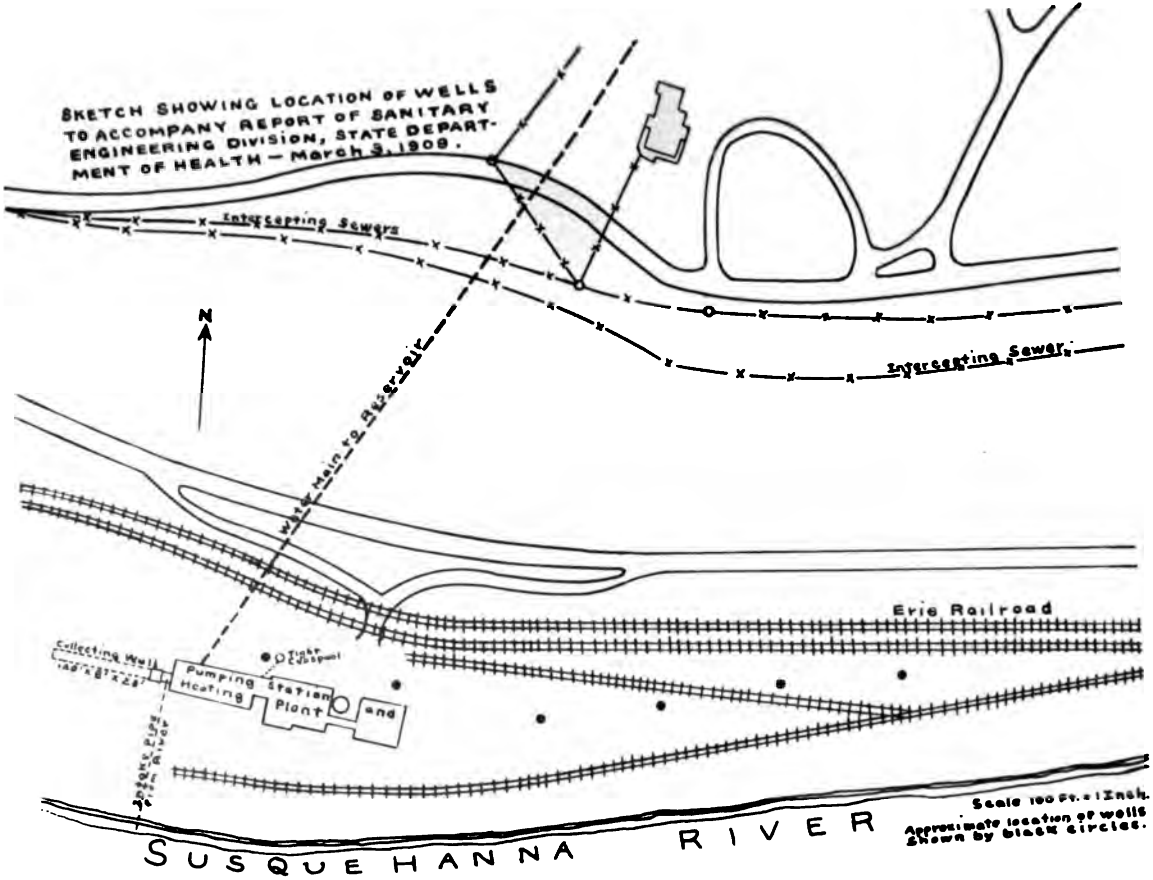
The pumping plant is located in a brick building used to supply the hospital buildings with heat. There are two pumps of the Worthington type, one twenty-four years old, the other fourteen years old, having an estimated capacity of one million and one and a half million gallons per day respectively, and are driven by steam power. The one is a 16″ x 30″ x 11″ x 18″ compound pump having a 24 foot lift. The other is a 12″ and 18″ and 29″ x 11″ x 18″ triple expansion pump having a lift of 21 feet. Both pumps have a 12″ suction and pump against static and dynamic heads of 160 feet and 180 feet respectively. Water is pumped continuously and directly into the mains, the surplus being stored in a reservoir about 1,000 feet north of the main building. The reservoir is uncovered and was excavated in the side of a hill. It is 200 feet long, 70 feet wide, 8 feet deep, and has rip-rapped side slopes of 1 to 1. Its storage capacity is estimated at 700,000 gallons.

The collecting well and pumping station are located on a level strip of land at the edge of the Susquehanna river, between it and a rather steep hill with a slope of almost 1 to 1, on the top of which the main hospital building is located, and at the immediate foot of which is a public highway and the tracks of the Erie Railroad. This strip of land is from 100 to 300 feet wide, being at its maximum width opposite the pumping station. For the most part it is low ground filled in to about the depth of 10 feet with ashes and cinders from the heating plant. This covers a stratum of clayey loam 10 feet to 15 feet in thickness, overlying a sand and gravel layer about 12 feet thick, under which there is another layer of clay. These strata are horizontal and it appears may have been formed by sedimentation and by a change in the channel of the river.

The present supply is obtained largely from the Susquehanna river, and it is now proposed to obtain the entire supply from wells. Accordingly six 6-inch wells have been driven along the railroad track at intervals of about 120 feet, the location of which is shown approximately on the accompanying sketch. Tests made of these wells with a small steam pumping outfit have shown that 50 to 85 gallons per minute can be pumped from one well without lowering the level in the wells adjoining. It is now proposed to install an air compressor in the pumping room and to force water from these wells into the collecting well from which the existing service pumps will take their supply.

The samples of water which were taken from one of the driven wells 20 feet north of the east and of the pumping station, the second shown in the sketch accompanying this report, were sent to the State Hygienic Laboratory for chemical and bacteriological analysis. The water was pumped for an hour before taking sample for analysis and is considered representative of all the wells. The results of this analysis in parts per million are as follows:

Color	Trace	Free ammonia .	0.020
Odor, hot	1 Vegetable	Alb. ammonia .	0.030
Odor, cold	1 Vegetable	Nitrites	0.001
Turbidity	Clear	Nitrates.	2.40
Solids, total . . .	241	Oxygen consumed	0.40
Loss on ignition.	45	Chlorine	11.5
Mineral residue.	196	Hardness, total.	148.6
Alkalinity			106.0



SKETCH SHOWING LOCATION OF WELLS TO ACCOMPANY REPORT OF SANITARY ENGINEERING DIVISION, STATE DEPARTMENT OF HEALTH — March 3, 1909.

There were 22 bacteria per c.c. and in no case were bacilli of the B. Coli type found.

These results indicate a very hard water of good sanitary quality. The organic matter present is doubtless vegetable in its nature due probably to peaty deposits in the gravel layer.

The inspection made at the time the above samples were taken with the exception of a cesspool and a privy, revealed nothing of any consequence liable to contaminate the supply from these wells. On the steep hillside about 350 feet north of the wells there is an intercepting sewer. This, however, is in clayey soil and it is improbable that any pollution will result by leakage from this sewer. Near the first of the wells north of the pumping station a tight cesspool 5 feet in diameter and 8 feet deep has been constructed. A privy stands to the east of the pumping station not far from the third of these wells, but this is to be abandoned soon.

The nearest of the wells is 100 feet from the Susquehanna. The ground water appears to be at practically the same level as the river. A test to determine whether there would be any inflow from the river was made during the past summer by shutting out the river water from the collecting well and keeping the level of the water in it lower than that in the river for a number of days. The ground water pumped from this collecting well remained at a constant temperature which was considerably lower than that of the water in the river. Chemical analyses of the water from time to time by Mr. B. E. Nelson, Chemist to the State Hospital, have shown no inflow from the river.

As a result of using unpurified water from the Susquehanna river a severe epidemic broke out in the hospital during the winter of 1900-1901. Typhoid fever existed at the same time at Great Bend fifteen miles up-stream. A year later another epidemic occurred, but was much milder in its nature. Since that time all water used for drinking purposes is first boiled and with the exception of a few sporadic cases chiefly among employees, no further outbreak of typhoid fever has occurred.

Summarizing briefly the results of this investigation as outlined above, I would conclude that:

(1) The present supply, consisting largely of raw water from the Susquehanna river, is unsafe and it is important that steps

should be taken without delay to abandon the use of unpurified river water.

(2) It appears that a water of good sanitary quality can be obtained from the driven wells. This water is very hard, however, and while hardness in water is not objectionable from a sanitary standpoint, and while the hardness of the water from these wells is not hard enough to make it objectionable to the taste, it is nevertheless objectionable since it is liable to cause an incrustation of the boilers in the heating plant and to materially increase the amount of soap used for laundry purposes.

(3) The privy and cesspool referred to above, owing to their proximity to the driven wells, are a menace to the purity of the proposed supply, and it is imperative that immediate steps should be taken to prevent pollution from these sources. The privy should be removed and the contents of its vault disinfected. Since it is practically impossible to construct an absolutely tight cesspool, and owing to its proximity to one of the wells, the newly constructed cesspool ought not to be used but should be replaced by another on the other side of the pumping station near the edge of the river.

(4) The well in the present collecting well, which has been driven to a depth of ninety feet, yields a brackish water high in chlorine and nitrates. Since this water is liable to have a corrosive action on the metal in the boilers, it is important that this well be sealed so as to prevent the flow of water from the lower stratum.

(5) The system of air lift proposed is a suitable means for pumping water and if properly installed and operated should fulfill the purposes required in connection with the securing of a water supply from the driven wells.

(6) It is probable that the yield of the old wells may be considerably increased by drawing from them in a manner similar to that proposed for the new wells, since their present yield is due to only a small head.

In the above report I have made no attempt to compare the practicability, desirability or economy of securing a suitable water supply for the Binghamton State Hospital from any other source such as, for instance, the impounding of a surface supply from some small stream, the installation of a filtration plant to purify the water from the Susquehanna river, or arrangements with the city of Binghamton to furnish the hospital with filtered water from the city mains, water from which sources would be only a third as hard as that obtainable from the driven wells.

These are questions which I feel are not within the scope and duties of this Department at this time, nor do I feel that they can be satisfactorily determined except by a comparison of well-designed plans of these alternate propositions and of careful estimates of cost based thereon.

It would seem, therefore, in view of the satisfactory sanitary quality of the water, and notwithstanding the considerable hardness of the water, that a suitable supply of water can be obtained from the driven wells; and if this supply is properly developed in accordance with the plans proposed, these wells should yield a safe and ample supply for the State Hospital at Binghamton. It is by no means certain, however, that this source of supply would be better than a filtered supply from the Susquehanna river.

I therefore beg to recommend that from the standpoint of sanitary quality your approval be given to the proposed plan for an additional water supply for the Binghamton State Hospital. It is expected, of course, that when the alternate methods have been considered and the plans are completed, that they will be presented to you for final approval, at which time it will be more practical to pass on details of methods and equipment to be installed.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

ALBANY, N. Y., *July* 15, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to report that plans for alterations and additions to the water supply system of the Binghamton State Hospital were submitted to this Department for approval by the State Architect July 9, 1909.

In accordance with the application of Hon. F. B. Ware an investigation of the proposed water supply for the hospital was made by the Engineering Division on February 19, 1909, and the results of this inspection, covering the sanitary quality of the water from the six new driven wells, were submitted to the State Architect in the report dated March 3, 1909.

The plans show that it is proposed to put 12-foot strainers having ⅜-inch holes in the five existing wells, to install new manholes and new piping with all appurtenances for a new suction line from the new wells and a discharge line to the existing well chamber. It is proposed to ask for alternate bids for the installation of either a steam pump or an air lift and air compressor in connection with the present plant.

These plans were submitted in conformity with the recommendations embodied in the report of March 3, 1909, and I therefore recommend that the plans be approved.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

CANASTOTA

ALBANY, N. Y., *May* 12, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— In compliance with the request of the health officer, Dr. Knapp, in a letter to you dated May 4th, in which he states that the village expected to increase their supply from certain sources, and asks advice in the matter, I beg to say that on May 11th I visited Canastota for this purpose.

I met Dr. Knapp and other officials of the village, and in company with Dr. Knapp, Mr. Thomas Hollinger, secretary of the water board, and Mr. G. M. Barker, superintendent, I drove to points along Canastota creek from which it was anticipated to take a new supply, and discussed with them the various features, factors and conditions connected with the proposed additions to their supply and also in connection with their existing works.

It should be stated at the outset that the sanitary condition of the Canastota supply has been investigated by this Department on more than one occasion, and that both in 1907 and 1908 inspections and reports were made covering the conditions of this supply and containing recommendations as to desirable changes that should be made. More particularly it was called to the attention of the village that the present supply is subject to pollution from different sources, and it was recommended that in order to properly protect the supply the present supply should be adequately filtered.

Later, recommendations were made to clean the reservoir and take suitable precautions to prevent certain pollution upon the watershed. So far, however, no filtration works have been introduced, although the reservoir has been flushed and certain other precautions have been taken to protect the supply.

It is thus evident that the purity of the present water supply of Canastota is questionable and that before, or in connection with, any efforts to obtain an increased supply, the question of improving the quality of the present supply should be considered.

Considering now the proposed means for increasing the supply of the village, I find that during last year from August to December the village was quite short of water and it was necessary to temporarily pump from Canastota creek about two miles below the present reservoir in order to maintain a sufficient supply for the purposes of the village. It is in view of these conditions that the water board now proposes to increase permanently the supply, and they had in mind and explained to me two means for doing this. One of these was to locate a pumping station near and on the west side of the creek just north of Seneca road and pump the raw water into the present main leading from the existing reservoir. The other was to construct an additional storage reservoir, holding some 30,000,000 gallons of water, on Canastota creek about a mile above the present reservoir, thus providing storage which would carry them over the dry season.

Since it has already been pointed out that the present supply is subject to undesirable pollution, especially from the railroad and agricultural operations upon the watershed, it is evident that the use of the creek at a point lower down than the present reservoir, especially within the village limits, would furnish a supply which would be even more grossly polluted than the existing one. In other words, there would be an additional amount of pollution from the railroad, more cultivated fields bearing surface pollution into the stream, and what is still more dangerous would be the opportunity for accidental or wilful pollution immediately near the settled portion of the village.

In regard to the second proposition of having a storage reservoir on Canastota creek a mile above the present one, it is evident that this would not involve any more pollution, and possibly slightly less pollution, on account of storage, than takes place with the present supply. For this reason the additional water from this storage would provide a better supply than the existing one, although, as previously pointed out, the existing supply and consequently any new supply from the same source would be subject to undesirable pollution.

I have not discussed the question of springs from the cemetery or any local conditions surrounding the use of the water at or below this point, since I cannot recommend this stream at any point below the cemetery. During my inspection of the locality at and above the cemetery, I wish to suggest that it may be possible to secure a ground water source from the gravel-bearing strata which appeared to be present in this valley in this vicinity, by means of a system of shallow driven wells spaced across this valley. This is a matter that cannot be settled definitely now, and its feasibility can only be determined after an engineering investigation and testing. If it is possible, however, to secure such a supply of ample capacity, it would necessarily be a filtered supply and one superior to the existing supply.

In view of the above, it is my opinion, therefore,

(1) That owing to the pollution of the present supply as pointed out in previous reports from this Department, it is necessary for the village to filter their present supply or secure a new supply, if this supply is to be used.

(2) That the proposal to take raw water from the creek near Seneca road cannot be recommended from a sanitary standpoint, and it would not be wise, owing to the pollution that would occur, to take a supply from this point without efficient filtration.

(3) That the securing of an additional supply by storage upon the watershed above the present reservoir could provide water that would be equal to, or slightly better than, the existing

supply, but not sufficiently better to preclude the necessity for filtering it, especially if it were discharged freely into the creek and was turned into the present system at the existing intake.

(4) That it might be possible upon further study to secure a ground water supply of adequate capacity and of better quality than either the existing or the proposed new auxiliary supplies under consideration.

I beg to suggest finally that a copy of this report be transmitted to the health officer and water board of Canastota with suggestions that they be guided by the above recommendations and that they secure expert services to determine definitely the question of whether a permanent water supply could be developed in the valley above the cemetery, or in regard to the filtration of their supply, provided such a ground water supply could not be developed.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *May* 27, 1909.

LEHIGH VALLEY RAILROAD COMPANY, 143 *Liberty Street, New York City:*

GENTLEMEN:— I wish to take up with you an important matter concerning the purity of the water supply of the village of Canastota which is affected by the present operations of the Elmira & Cortland branch of your railroad.

As you are probably aware, the location of the roadbed of this branch parallels very closely Canastota creek between the stations of Blakeslee and Canastota, and this stream between these stations flows for a distance of about three miles through the watershed used as a source of water supply for the village of Canastota. The tracks run very close to the stream at a number of places along this section of the road, crossing the stream and its tributaries at intervals.

It must be evident to you that so long as the toilet-rooms on trains operated over the portion of this branch of your road between the stations above specified are allowed to remain open for use according to present custom, there will continue to be a real and direct opportunity for dangerous contamination of the Canastota water supply. The excreta of persons riding on these trains, who may be using the closets between Blakeslee and Clockville, may drop either directly into Canastota creek or along the railroad bank in such close proximity to the stream that it may be easily washed into the creek and the pollution carried directly and rapidly into the intake of the water supply system at the reservoir near Clockville.

It seems unnecessary to state that a contamination of the water supply from excrement discharged thus from railroad trains is of a very dangerous character. The dejecta and other excretions of typhoid fever carriers, of persons in the early or walking stages of the disease, or convalescents, contain typhoid fever germs of a virulent type and in considerable numbers; and if any such persons should use these closets while trains are passing over the watershed of the Canastota supply, a direct typhoid infection of this supply would readily follow which might be the cause of a serious epidemic of this disease among the consumers of this supply.

It is in view of this constant menace to the purity of the water supply of Canastota resulting from the present custom of permitting the use of closets on trains passing over the watershed of this supply, that I wish to ask the co-operation of your company in taking such action as will remove so far as practicable all possible infection. I believe that measures to prevent this infection can be most effectively accomplished by the issuance of suitable orders by your company requiring that the doors of all toilets be closed between Perryville and Clockville, running north, and between Canastota and Blakeslee, running south; and by the posting of proper notices of these orders above these toilet doors with explanation of the reasons for such action.

I beg to ask, therefore, that you give this question your early consideration and that you advise me at an early date as to *how* soon, and to what extent, your road will co-operate with this Department in the matter of having carried out the measures outlined above to prohibit the use of toilet-rooms on all trains while passing over the watershed of Canastota creek between the stations above mentioned.

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

ALBANY, N. Y., *June* 22, 1909.

Board of Water Commissioners, Canastota, N. Y.:

GENTLEMEN:— I beg to advise you that after taking up the matter of preventing a pollution of Canastota creek by closets on passenger trains of the Lehigh Valley railroad with the company, I have just received a letter from the first vice-president of the company stating that, after a full investigation, the company has concluded to issue the necessary instructions to their trainmen to the effect that toilets on passenger trains must be locked while passing along this stream.

I fully believe that, if these orders are strictly carried out by the company, the menace to the purity of this supply resulting from discharge of train pollution will be largely, if not wholly, eliminated. The successful attainment of this end, however, will depend entirely upon the strictness with which these orders are carried out, and I trust, and would suggest, for the welfare of all concerned and as the most successful policy to pursue, that a thorough co-operation between the village authorities and the railroad authorities be maintained in this matter.

The legal enforcement by this Department or your board of health or the village in a matter of this kind would be difficult, and even with full legal authority the practical attainment of desired results would still remain difficult. For this reason I urge co-operation.

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

CAPE VINCENT

During March and April, 1909, there were fourteen cases of typhoid fever in the village of Cape Vincent, Jefferson county. The Chief Engineer visited the village and investigated the conditions in regard to both water supply and sewerage, giving advice at the time of his visit as to improvements that should be undertaken. Subsequently, the Commissioner addressed the following letter to the president of the board of health:

ALBANY, N. Y., *May* 3, 1909.

MR. JAMES H. DURHAM, *President Board of Health, Cape Vincent, N. Y.:*

DEAR SIR:— Since the visit of our Chief Engineer, Mr. Horton, at Cape Vincent, and his review of the typhoid fever situation as well as the sanitary conditions in general in your village, I have meant to write to you more fully in regard to these matters.

In the first place, the reports from Mr. Horton indicate very clearly that the trouble from typhoid fever is one associated almost entirely with the contamination of your water supply — this contamination at certain seasons of the year and under unfavorable conditions of stream flow and winds bringing infection from the Black river and the shores of Lake Ontario down to your intake. Mr. Horton advises me that this matter was fully discussed between himself and members of your boards of health and trustees, as well as at a public meeting of the citizens of the village, during which he pointed out the causes and remedies of the prevalence of typhoid fever somewhat at length. If there are, however, other points about which your board or residents of the village are in doubt, I should be pleased to give you further information or explain them further in detail.

I wish now very particularly to refer to the situation in regard to the sewerage of your village, and in what I have to say I wish to suggest and request that you transmit this to the village board of trustees for their consideration also. Our engineer found that the village is very inadequately provided with a proper system of sewerage. This is undoubtedly known to the governing officials of the village, but I wish to point out particularly wherein improvements should be made.

In the first place, the system has been built and developed somewhat indiscriminately upon the combined system — that is, where the surface water and the sewage are conveyed in the same pipes I find that many of these drains or sewers are inadequate to carry off the surface water during the rainy season of the year, and, as a result of this condition at this time, I wish to point out that this condition will continue to grow worse as more impervious areas become tributary to these sewers or drains.

Quite a number of houses in the village are connected with these sewers either for purposes of cellar drainage or for disposing of sewage. These drains are not constructed separately as they should be, and many of the cellar drains are not provided with traps to prevent back-water, which has or may occur from the sewer in the street.

Ultimately, it will be necessary, in order to protect the shore front, to intercept the sewage of the village and carry it down to a point below the village and thereby provide proper disposal. This may not be an immediate necessity, but, since it ultimately must come, it is very desirable on the grounds of economy that the sanitary sewage be separated from surface water.

It would seem, therefore, that the interests of the village would be best subserved by a consideration at once of the matter of providing a comprehensive plan for a separate system of sewers, and to provide for all future construction in strict accordance with such a plan. Such a plan would not be expensive, and I would strongly recommend that you employ a competent engineer to prepare plans for such a system of sewers. Plans should also be prepared for improving the drainage of the lower section of the village adjoining the river front, where it appears that there is considerable need of improvement and where, as found by our engineer, there are certain hydraulic conditions which call for careful study.

I trust that this matter will be at once considered by your boards of health and trustees, and that steps will be taken by them along these lines at as early a date as possible.

In regard to the need of the village for an improvement of the present water supply, this matter was taken up by our engineer while in Cape Vincent, when he pointed out the necessity for providing a water purification plant, and pointing out that until such a plant is installed, the people should take precautions to boil the water. As in the case of securing advice and providing plans for sewerage improvements, it is also essential to secure expert advice, and I would strongly urge you to employ a competent expert in water purification as soon as the village is in a position to undertake this improvement of their supply.

Assuring you of my deep interest in these matters relating to the public health of your village and also of the assistance of this Department in a general way, and within the limits of its resources, I am,

Very respectfully,
EUGENE H. PORTER,
Commissioner of Health

COMSTOCK

GREAT MEADOW PRISON

ALBANY, N. Y., *October* 16, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of an investigation made under your instructions and in accordance with the application of Hon. F. B. Ware for the approval of plans for securing a water supply from Dolph pond for Great Meadow Prison, Comstock, N. Y.

On October 13, 1909, Mr. C. F. Breitzke, assistant engineer of this Department went over the ground and made an examination into the physical and sanitary conditions surrounding Dolph pond.

Dolph Pond is a shallow body of water located two miles north west of Comstock. It is about seventeen acres in area. As near as could be determined by observation from the shore nearly half of this area is under three feet in depth and is covered with lily pads and other vegetable swampy growths. The watershed has an area of 1.6 square miles, and is a wild uninhabited region covered with a second growth forest, and so far as is known free from contaminating sources. The geological formation is an ancient crystalline rock probably metamorphic sandstone, which lies close to the surface and outcrops frequently. The soil is sandy.

The plans submitted by the State Architect provide for raising this water at the present time 6 feet, the effect of which would be to create a reservoir having a probable average depth of about 7 feet. The west side of the reservoir will be steep. On the east side there are two low points which if undiked would give a shallow flow. The area of the watershed of 1.6 square miles which, with a summer flow of 0.25 cubic feet per second, per square mile, would give a daily yield of 260,000 gallons, or a quantity sufficient to supply the 1,300 inmates of the prison, at a rate of consumption of 200 gallons per capita. It is estimated that the amount of storage obtained by raising the water 6 feet, and without drawing below the present level will be 31,200,000 gallons, which on the assumption that the daily consumption at the institution will be 260,000 gallons per day, would supply the institution for about 120 days or approximately four months. This would give a total available daily yield during period of minimum flow in round numbers of 500,000 gallons from which it is evident that so far as quantity is concerned, the proposed reservoir would yield ample water for the institution on the above basis.

In reference to the quality of the water there are two things to be considered:

1. Safety with reference to contamination.

2. Potability of the supply with reference to the important esthetic qualities such as vegetable growths and consequent tastes and odors.

Concerning the first it appears from the inspection that there is no resident population on the watershed. There was, however, an old boat drawn upon the shore and some poles and fish lines were lying near it. If fishing and boating will be prohibited, this water should be free from danger of contamination. Owing to the fact that the watershed was practically free from pollution, and that the water is a surface supply from a wooded country in a geological formation which would not impart undesirable chemical constituents to the water, it was decided from the inspection that no analyses of the water are necessary.

In regard to the second matter a more serious condition is presented. If the supply is to be free from objectionable qualities it will be desirable, if not necessary, to remove the present growth and to strip the area to be flooded. The pond should be lowered before construction and the shallow portion now submerged also stripped.

The plans submitted by the State Architect consist of two blue prints, one showing plans and details, the other profiles and details. These have been carefully looked over and examined from the standpoint of the salient features of design.

The general type and section of the main dam seems to be of suitable design. It is proposed by the construction of this dam, which is to be twelve feet high, to ultimately raise the water level in Dolph pond ten feet above the existing level. The present plans, however, call for the construction of only enough of the ultimate dam to raise the water level six feet. The spillway and one of the supplementary dams to prevent overflow near the northeast corner of the reservoir, are not shown on the plans. These, it appears from a memorandum of an interview between Mr. H. W. Taylor of the State Architect's office and Mr. Breitzke, in regard to the plans, are not required for the present contract and have been omitted from the plans so as not to confuse the contractor. The low points on the east side of the reservoir are according to levels taken by a surveying party from the State Engineer's office at an elevation of six to seven feet higher than the present water level of Dolph pond and since it is proposed at the present time to raise that water level only six feet, they are not needed and their construction may be deferred until such time as the requirements of Great Meadow Prison will necessitate the completion of the main dam.

The plans show that on account of the shallowness of Dolph pond near the shores, the intake pipe is to extend into the pond 400 feet to an intake lower. The water at this point will be eighteen feet deep when the dam raising the water level six feet is completed and the reservoir is full and the intake has been designed to take water as required at three depths located at the surface and six feet and twelve feet below the surface, respectively.

The pipe line is eight inches in diameter, has been designed to furnish 620,000 gallons per day under a head of 155 feet at the prison. This amount and pressure is estimated to furnish three fire streams of 100 gallons per minute, each to be thrown over the roof of the Cell block. The pipe line appears to be of sufficient size and capacity to deliver the required amount of water. The blow-off and air valves in the pipe line seem to be suitably located.

In view of the foregoing results of inspection and conditions found to exist and their bearings on the potability of this supply, if the dam and pipe line are constructed in accordance with plans, I beg to conclude that:

1. The proposed plans have been examined here only from the salient features of design such as its sanitary aspects including the esthetic quality of the water, the yield, and such features of the construction as pertain to the sufficiency and general practicability of the design, it being assumed that the details of design have been adequately looked into by the State Architect.

2. The water supply, which can be obtained from Dolph pond, will be free from contamination so long as there is no resident population on the watershed and fishing and boating on Dolph pond reservoir is prohibited.

3. The plans and contract do not provide for stripping the reservoir site or the shallow portions of Dolph pond. Unless this is done there is a strong probability that undesirable growths will develop and at times produce odors and tastes in the water.

4. If the dam is properly constructed and the pipe line laid in accordance with the plans and the accompanying specifications these works should prove adequate for impounding and delivering the required amount of water to the institution.

I, therefore, recommend that the plans be approved upon the condition that the shallow portion of Dolph pond and the adjacent area which will be submerged, be stripped of its vegetation and top soil.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

ALBANY, N. Y., *October* 25, 1909.

Hon. F. B. WARE, *State Architect, Albany. N. Y.:*

DEAR SIR:— I am returning herewith plans for proposed water supply for Great Meadow Prison, Comstock, N. Y., which have been this day approved by me with the condition that all vegetation and top soil shall be removed from the bed and the submerged areas adjacent to the reservoir as outlined in the accompanying report of the Chief Engineer.

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

CORNING

During the year, after investigation of the conditions surrounding the Corning water supply had been made by members of the Engineering Division, advice was given the city authorities as to steps which should be taken for improving the quality of the present supply or arranging for a new source of supply.

NEWBURGH

On October 21, 1909, request was made by the board of water commissioners of the city of Newburgh that an engineer from this Department make an inspection of the camp of laborers employed by contractors on improvements at their reservoir. An inspection was made on October 28, 1909, in accordance with the above request, and a copy of the following report was transmitted to the local authorities on November 1, 1909.

ALBANY, N. Y., *October* 29, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of an inspection made in accordance with your instructions and at the request of the board of water commissioners of the city of Newburg of the camp of laborers employed by contractors on improvements under way at Washington lake, the reservoir impounding their water supply.

On October 28, 1909, Mr. C. F. Breitzke, assistant engineer of this Department, visited Newburgh and in company with Water Commissioners Hawkes, Buck and Terrell and City Engineer Blake made an inspection of the labor camp in question. This camp will ultimately provide for the accommodation of fifty or more Italian and Hungarian laborers and will be maintained until some time next May.

The camp is located just east and south of the southern end of Washington lake near the highway, about 200 feet from a marshy area and small stream flowing into the reservoir from the south, on land sloping toward this stream. Water is obtained from a spring near this stream at a point about 900 feet distant. The camp at present consists of three buildings, a supply house and saloon located near the highway and about 500 feet from the reservoir, a shanty furnishing sleeping quarters for about twenty-five men and a privy located in rear of the shanty about 200 feet from the stream tributary to the reservoir.

The privy is provided with a galvanized iron tank which is said to be emptied every morning, two laborers being detailed to carry it to a point over the brow of the hill about one-quarter mile distant where a hole has been dug in a field. There was, however, no path leading to this point and the laborers carrying the privy tank must climb over a number of stone walls in order to reach the place of disposal. In passing through a nearby corn field our engineer found numerous deposits of human excrement. This it was explained to him was due to the fact that while the camp had been in existence only a month, the privy had been provided only a week.

The camp is under the immediate supervision of Mr. Gilroy, superintendent for the Todd Construction Company, who stated that the laborers have been warned to keep away from the reservoir and to refrain from defecating or urinating elsewhere than in the receptacle provided for them under penalty of a fine of $5 and loss of job. Considering, however, the difficulty, if not impracticability, of keeping this class of laborers under surveillance, even if such rules were strictly lived up to, there would still exist the menacing danger of having a camp of such a class of laborers working and living in close proximity to the reservoir. Further than this it is very difficult to enforce any suitable sanitary regulations for the protection of the reservoir under conditions found to exist by our engineer. For this reason I am very strongly of the opinion that the existence of this camp at its present location as was evidenced by the insanitary conditions observed around the camp is a great menace to the water supply.

In fact, this camp was located at this place after it had been agreed to locate the camp at another point southeast of the lower reservoir and off the watershed. The approved site is not far from the present one and is convenient to the work, and if a well is dug or driven to furnish a water supply, is admirably suited for a camp.

The contract under which the improvements are being made provides that:

"Necessary sanitary conveniences for the use of laborers on the work * * * shall be erected and maintained by the contractor in such a manner and at such points as shall be approved by the Board of Water Commissioners, and their use shall be strictly enforced. The contents from the same shall be removed with sufficient frequency to prevent nuisances and shall be disposed of to the satisfaction of the Engineer. The contractor shall supply drinking water to all his employees * * * shall obey and enforce such other sanitary regulations and orders, and shall take such precautions against infectious diseases as the Board of Health may deem necessary. In case any infectious disease occurs among his employees, he shall arrange for the immediate removal of the patient from the work and isolation from all persons connected with the work.

"The building of shanties or other structures * * * will be permitted only at approved places and the sanitary condition of the grounds in and at such shanties or other structures must at all times be maintained in a satisfactory manner."

If the camp is removed from the watershed and if the above specifications are fully carried out and properly lived up to, the present danger of contamination of the water supply would be largely eliminated.

In view of the foregoing, I therefore beg to submit the following recommendations and conclusions:

(1) The insanitary conditions observed in the vicinity of the camp afford an opportunity for pollution of the water supply which, if continued, may be followed by serious consequences.

(2) The present site of the camp is unsuitable and dangerous, and should be given up in favor of the one above referred to or some other position equally safe.

(3) The provisions in the specifications referring to the safeguarding of the supply from pollution should be carefully observed during the time the laborers are at work upon the watershed.

(4) Even after this camp is removed, the proper authorities should carefully disinfect all places upon and around the site of the recent camp. This refers more particularly to the excrement found on the ground in the adjoining field and other possible contaminating sources resulting from nuisances at this camp.

I should further recommend that copies of this report be sent to the boards of water commissioners and health of the city of Newburgh and that their attention be especially directed to the necessity of removing at once the camp from its present site; to the importance of protecting the reservoir from pollution by laborers while at work in its vicinity; and to the necessity of removing the danger that at present exists from the presence of this camp as pointed out above, and which may be reflected at any time by an outbreak of typhoid fever in the city.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

OLEAN

ALBANY, N. Y., *May* 8, 1909.

DR. JOSEPH C. CLARK, *Health Officer, Olean, N. Y.:*

DEAR DOCTOR:— I have yours of May 6th with reference to the conditions in your city, and note what you say with reference to the flooding of the wells and the city water supply.

I also have noted carefully what you say with reference to the sending of a bacteriologist to Olean, and I assure you that it is the desire of this Department to be of every service that we can to any municipality so far as we can within the appropriations allowed us by law, and it is unnecessary for anyone to "demand" that we assist them, as we are very glad to do it upon request, but it seems to me that there is very little that a bacteriologist could do there at the present time.

From the tenor of your letter it appears that you fully realize the seriousness of the conditions resulting from the flooding of your waterworks by the river water, and it hardly seems necessary for me to emphasize its importance.

There are, however, certain phases and details as to sanitary significance of these conditions which should be brought to your attention, and these I wish to point out to you.

From a general standpoint, the effect of a flood of this nature should be viewed somewhat in the nature of a public calamity, particularly of a potential nature; that is, the flood waters carrying the polluted washings of the territory above Olean must, if they have overflowed the public water supply source, public wells and inhabited areas of the village, have subjected them to serious contamination. The public water supply is, of course, the most serious question, and it does not need the presence of a chemist or bacteriologist to substantiate the fact that this water supply is infected and that a possible epidemic might result if unusual precautions are not taken.

The action of your board in requiring that this public water supply be boiled before using for domestic purposes is certainly the first and wisest duty for it to perform. This boiling of water should be continued until the last traces of infection have, through natural agencies, been so attenuated that no danger remains. The value of chemical and biological evidence would, therefore, be in determining by, say, weekly examinations, when this danger point has been passed.

It hardly appears necessary or desirable for the Department to furnish a bacteriologist or chemist at Olean for the purpose of examination, as requested in your letter, but I have arranged at once to have one of our representatives visit your city and review the situation and give the board general advice and instructions as to what measures should be instituted or carried out until the danger period is passed. I shall be pleased, at the same time, to have these weekly examinations made through our laboratory and samples collected by you weekly until it is found that the water supply is again safe to use without boiling.

Since the people may be protected against infection by boiling of the water and if the restrictions regarding this boiling are strictly carried out, it would seem that weekly examinations of the water supply by this Department might be all that is necessary. If our sanitary engineer, who will visit your city, should conclude that it might be desirable for one of our laboratory men to be on the ground, I will endeavor to see what can be done.

In regard to the wells which have been overflowed, the board should likewise notify every owner that these wells should not be used for a period of at least three months, or until these wells have been found to be free from any infection that has occurred in them by the flood. It is apparent to anyone that the danger resulting from the flooding of any district is that the flood waters may carry serious infection which may be deposited upon the soil in cellars and other places where persons must necessarily come in contact with it. This danger will, of course, decrease with the lapse of time, but it is probable that many weeks, if not months, may elapse before the last appreciable traces of these dangers may be entirely removed. Domestic cleanliness in and around households in all places that have been flooded is about the only practical means by which this danger can be eliminated.

The people in the flooded district should, therefore, be advised as to this point, and an oversight of the sanitary conditions should be kept by the local board of health. If the precautions outlined above are continued until all traces of infection are passed, there need be no undue anxiety as to the occurrence of any epidemics such as have occurred in Ithaca, Butler or even at Corning. Indeed, it is quite as essential to guard against or quell any public excitement or alarm in this regard, which, as you may know, does little good and may obstruct the city authorities in wise and conservative action.

Our representative will be in Olean, I expect, on Monday. It was impossible for me to get one of our men there to-day, or I would certainly have done so.

I trust that your board will keep me regularly informed as to the situation until the danger from the flood has subsided.

Very truly yours,
EUGENE H. PORTER,
Commissioner of Health

ALBANY, N. Y., *May* 11, 1909.

MR. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— I beg to report the results of an examination of the source of the public water supply and of the city waterworks of Olean, Allegany county, made at your direction on May 10th.

The examination was made at the request of Health Officer J. C. Clark, M.D., the city board of health desiring to take all possible precautions against an occurrence of typhoid fever in the city due to possible infection of the public water supply and of many private wells which may have been contaminated during the flooded conditions of May 1st and 2d.

The public water supply for the city of Olean is derived from 108 driven wells located on the north side of the Allegheny river on river flats adjoining the river and west of South Union street. There are 52 3-inch wells driven to a depth of 27 feet, 52 3-inch wells driven to a depth of 36 feet, 2 6-inch wells 72 feet deep, and 2 8-inch wells 72 feet deep. The wells are driven through 5 feet of soil, 7 feet of clay, 7 feet of sand and from 8 to 17 feet of gravel.

The well pipes connect with two ten-inch suction mains leading to the pumping plant on the opposite or south side of the river.

In company with Mayor W. H. Mandeville and Health Officer Clark an inspection was made of the pumping plant and of the equalizing well known as the " Cook " well, located near the pumping plant and 50 or 60 feet from the river.

The ground surface at the pumping plant and at the Cook well has an elevation of 10 or 12 feet above the river at ordinary high-water stage. The well is formed by a circular wall of 16-inch paving brick masonry, 40 feet deep and extending about 6 feet above ground. Its diameter is about 15 feet and at the time of inspection the water level in the well was about 17 feet below the top of the curbing.

The pumping plant is equipped with one 14-inch Catskill horizontal pump and one 14-inch Snow vertical pump. Suction pipes 16 and 18 inches in diameter extend from these pumps to the equalizing well and each 10-inch suction main from the driven wells across the river is connected both with the 16-inch and the 18-inch suction mains leading to the pumps, in one case the connection being made outside and in the other case inside the well. Valve arrangements permit pumping by each pump from both 10-inch suction mains and from the well at the same time, the 16-inch and 18-inch pipes having elbows and vertical pipes reaching to within a few feet of the bottom of the well. No valves are provided to close the 16 and 18-inch suction pipes in the well and thus permit pumping from the driven wells only.

Either one or the other pump is operated from 12 to 20 hours at a time, during which time the water level in the well is lowered from 7 to 10 feet. The water is forced to a reservoir on the hill south of the river. A new and larger storage reservoir on the hill with a capacity of 9,000,000 gallons was put into use during 1908.

During the flood of May 1st and 2d the river overflowed its banks, flooded 30 or 40 acres of the populated district of the city, covered the river flats on the north side of the river in which the wells are driven, to a depth of several feet and rose within about one foot of a rectangular opening in the Cook well curb, this opening being 2 feet wide and extending 2 feet 3 inches down from the top of the curb. A small amount or river water, however, found its way into the well through a settlement in the trench over one of the 10-inch suction mains which enters the well, the water following this pipe as it passes through the wall at or slightly above the water level in the well and carrying with it enough soil to appreciably roil the water in the well for a short time.

There is some chance that polluted river water flowing over the flats on the north side of the river might follow down the driven well pipes and contaminate the supply derived from these wells, but the greater opportunity for a direct infection of the water supply was brought about by the slight inflow of flood water into the Cook well as above described. On the other hand, the only sewage discharged from the city above the location of this well is through one sewer serving 700 persons and one serving 60 persons, both discharging into Olean creek which empties into the Allegheny river on the north side about three-quarters of a mile above the pumping plant. For this reason, especially with a high current in the river, the portion of the flood which overflowed the south bank of the river and passed by the pumping plant and well would be less liable to contamination by sewage from the city. Above Olean comparatively little sewage is discharged into the Allegheny.

However, a definite possibility exists of the water supply having been infected during the recent flood and the advice already given consumers of the public water supply by the board of health that the water be boiled before being used for potable or other household purposes should be continued until a sufficient period has elapsed and a sufficient number of analyses of the tap water has been made to show its sanitary condition.

The curb at the Cook well should be repaired and made watertight at the point where the 10-inch suction pipe enters. Further, the brick masonry should be pointed up for a distance of at least five or six feet below the ground surface, and the trench excavated to do this work should be filled with well rammed clay. Also, in such an exposed location, a cover over this well with a locked door and trap door would be a wise additional safeguard against chance pollution, while great care should be exercised by the attendants at the plant when it becomes necessary to enter the well in order to insure against infection.

The recent flood flooded over thirty or forty acres of the populated district of the city, overturning outside privies and thus making very possible a general contamination of wells of which it is stated there are about fifty in the flooded district. The danger brought about by this condition is much greater to the consumers of well water than it would appear, since a portion of the sewage discharged from the city reaches the river above this district as well. The health board should immediately serve individual notices on all well-water consumers that such water should either not be used for a period of three months or until analyses of the wells have been made so as to determine definitely the condition of each well under suspicion, or unless the water is boiled before being used for potable purposes.

Steps have already been taken to clean up the district flooded, and this work should be vigorously prosecuted by the city authorities and by the individual property owners as a safeguard against infectious disease. Although it is impossible for the Department to detail a bacteriologist to visit Olean, and make examination of water in all the wells under suspicion, it might be well, however, to send a sample case for bacteriological samples of water from six or seven selected wells in different districts when the next containers are sent for samples of the city water supply.

The sample of city water collected on May 5th, and sent to the Hygienic Laboratory shows considerable evidence of bacterial pollution and indicates the presence of bacteria of the B. Coli type, thus showing that the city water has received pollution by fecal matter, whether of human or animal origin is not known. Further, the total hardness of this sample indicated a large proportion of surface water when compared to the normal hardness of the city water.

It would seem, therefore, owing to the fact that little opportunity existed for admission of flood waters in large amounts to the Cook well, that in view of the results of the analysis, considerable flood water may have reached the city supply by seepage along the pipes or through broken pipes in the driven well district. Since this flat land in which the driven wells are located is more or less subject to overflow each year during high water, it would seem that every precaution should be taken against the admission of this flood water to the ground water level from which the supply is taken, except after filtration through the soil.

To prevent the ready access of the flood waters into the water-bearing gravel into which the wells are driven, I should recommend that a careful examination be made as soon as possible of each driven well, that all defective pipes be replaced if any such defective pipes are found, and that the soil for a considerable distance around each pipe for a considerable depth be removed and the excavation filled in with clay and tamped solidly around the pipe.

Another improvement under consideration by the city authorities and one which should be carried out for the greater protection of the supply is to provide greater waterway through the road dike near the bridge and directly into the river for flood flows instead of the present flood water area under the road at some distance from the bridge which is so located and the depression or channel to the river west of the bridge is so small that many of the minor floods must pass over the driven well district. The changed location and enlarged area of this flood water opening in the road dike, together with the necessary waterway or channel west of the road to the river, will prevent some of the minor floods from passing over the driven wells.

Until the above improvements are made to the wells, some considerable danger of contamination of the public water supply will exist during floods, and without doubt the city water should before use be boiled at present and until analysis has shown it to be free from the influence of surface and flood water contamination.

Respectfully submitted,
H. B. CLEVELAND,
Principal Assistant Engineer

In addition to the foregoing, correspondence was had and advice was given in matters relating to the quality of the water supply at the following places:

- Albion
- Bardonia
- Canton
- Catskill
- Central Valley
- East Syracuse
- Frankfort
- Fulton
- Geneva
- Granville
- Green Island
- Hamden
- Hammondsport
- Highland Falls
- Hudson
- Lyons
- Machias
- Marlborough
- Monroe
- Mt. Vernon
- Newark
- New Rochelle
- New York
- Niagara Falls
- Ogdensburg
- Oxford (Women's Relief Corps Home)
- Peekskill
- Pine Hill
- Pleasantville
- Poughkeepsie
- Prattsville
- Rensselaer
- Saratoga Springs
- Staatsburg
- Suffern
- Tarrytown
- Tupper Lake
- Watervliet
- Waverly
- Wellsville
- White Plains

PREPARATION OF RULES FOR THE PROTECTION OF WATER SUPPLIES

During the past year applications were received for the enactment or amendment of rules and regulations for the protection of public water supplies in the following four cases:

New York State Training School for Boys at Mohansic Lake.
Monticello.
Haverstraw Water Supply Company.
Syracuse Suburban Water Company.

Rules and regulations were enacted and recommended respectively in the cases of the proposed New York State Training School for Boys at Mohansic Lake, in Westchester County and the village of Monticello, but in the cases of the Haverstraw Water Supply Company and the Syracuse Suburban Water Company the rules have only been prepared and are awaiting further advices from these companies and from the local health authorities before their enactment. It is significant to note the comparatively few supplies for which applications for enactment of rules and regulations were received, and it is possible that among the reasons accounting for it may be the better understanding among local officials, due to recent experiences and court decisions, that these rules and regulations do not provide protection unless adequate compensation is made for any damages sustained by their enforcement; and a slight reluctance on the part of local authorities and water companies to assume the financial responsibilities entailed by the strict enforcement of these rules.

In accordance with the provisions of section 70 of the Public Health Law, the following sets of rules and regulations for the protection from contamination of public water supplies were enacted by the Commissioner of Health during the year.

Abstract of the New York State Public Health Law providing for the protection from contamination of the public water supplies throughout the State. Chapter 45 of the Consolidated Laws (Public Health Law)

"§ 70. *Rules and regulations of department.*—The state department of health may make rules and regulations for the protection from contamination of any or all public supplies of potable waters and their sources within the state. If any such rule or regulation relates to a temporary source or act of contamination, any person violating such rule or regulation shall be liable to prosecution for misdemeanor for every such violation, and on conviction shall be punished by a fine not exceeding two hundred dollars, or imprisonment not exceeding one year, or both. If any such rule or regulation relates to a permanent source or act of contamination, said department may impose penalties for the violation thereof or the noncompliance therewith, not exceeding two hundred dollars for every such violation or noncompliance. Every such rule or regulation shall be published at least once in each week for six consecutive weeks, in at least one newspaper of the county where the waters to which it relates are located. The cost of such publication shall be paid by the corporation or municipality benefited by the protection of the water supply, to which the rule or regulation published relates. The affidavit of the printer, publisher or proprietor of the newspaper in which such rule or regulation is published may be filed, with the rule or regulation published, in the county clerk's office of such county, and such affidavit and rule and regulation shall be conclusive evidence of such publication, and of all the facts therein stated in all courts and places.

"§ 71. *Inspection of water supply.*—The officer or board having by law the management and control of the potable water supply of any municipality, or the corporation furnishing such supply, may make such inspection of the sources of such water supply, as such officer, board or corporation deems it advisable, and to ascertain whether the rules or regulations of the state department are complied with, and shall make such regular or special inspections as the state commissioner of health may prescribe. If any such inspection discloses a violation of any such rule or regulation relating to a permanent source or act of contamination, such officer, board or corporation shall cause a copy of the rule or regulation violated to be served upon the person violating the same, with a notice of such violation. If the person served does not immediately comply with the rule or regulation violated, such officer, board or corporation shall notify the state department of the violation, which shall immediately examine into such violation; and if such person is found by the state department to have actually violated such rule or regulation, the commissioner of health shall order the local board of health of such municipality wherein the violation or the noncompliance occurs to convene and enforce obedience to such rule or regulation. If the local board fails to enforce such order within ten days after its receipt, the corporation furnishing such water supply, or the municipality deriving its water supply from the waters to which such rule or regulation relates, or the state commissioner of health or the local board of health of the municipality wherein the water supply protected by these rules is used, or any person interested in the protection of the purity of the water supply may maintain an action in a court of record, which shall be tried in the county where the cause of action arose against such person, for the recovery of the penalties incurred by such violation, and for an injunction restraining him from the continued violation of such rule or regulation.

" § 73. *Sewerage.*—When the state department of health shall for the protection of a water supply from contamination, make orders or regulations the execution of which will require or make necessary the construction and maintenance of any system of sewerage, or a change thereof, in or for any village or hamlet, whether incorporated or unincorporated, or the execution of which will require the providing of some public means of removal or purification of sewage, the municipality or corporation owning the water works benefited thereby shall, at its own expense, construct and maintain such system of sewerage, or change thereof, and provide and maintain such means of removal and purification of sewage and such works or means of sewage disposal as shall be approved by the State Department of Health. When the execution of any such regulations of the state department of health will occasion or require the removal of any building or buildings, the municipality or corporation owning the water works benefited thereby shall, at its own expense, remove such buildings and pay to the owner thereof all damages occasioned by such removal. When the execution of any such regulation will injuriously affect any property the municipality or corporation owning the water works benefited thereby shall make just and adequate compensation for the property so taken or injured. Until such construction or change of such system or systems of sewerage, and the providing of such means of removal or purification of sewage, and such work or means of sewage disposal and the removal of any building, are so made by the municipality or corporation owning the water works to be benefited thereby at its own expense, and until the municipality or corporation owning the water works benefited shall make just and adequate payment for all injuries to property and for all injuries caused to the legitimate use or operation of such property, there shall be no action of proceeding taken by any such municipality, officer, board, person or corporation against any person or corporation for the violation of any regulation of the State Department of Health under this article, and no person or corporation shall be considered to have violated or refused to obey any such rule or regulation. The owner of any building the removal of which is occasioned or required, or which has been removed by any rule or regulation of the State Department of Health, made under the provision of this article, and all persons whose rights of property are injuriously affected by the enforcement of such rule or regulation, shall have a cause of action against the municipality or corporation owning the water works benefited by the enforcement of such rule or regulation, for all damages occasioned or sustained by such removal or enforcement, and an action therefor may be brought against such municipality or corporation in any court of record in the county in which the premises or property affected is situated and shall be tried therein; or such damages may be determined by a special proceeding in the Supreme Court or the County Court of the county in which the property is situated. Such special proceedings shall be commenced by petition and notice to be served by such owner upon the municipality or corporation in the same manner as for the commencement of condemnation proceedings. Such municipality or corporation may make and serve an answer to such petition as in condemnation proceedings. The petition and answer shall set forth the claim of the respective parties, and the provisions of the condemnation law shall be applicable to the subsequent proceedings upon the petition and answer, if any. Either party may, before the service of the petition or answer respectively, offer to take or pay a certain sum. And no costs shall be awarded against either party unless the judgment is more unfavorable to him than his offer."

Concerning the obligation of water corporations or departments to provide for the cost of, or for the making of changes or improvements demanded by the rules, but not specifically mentioned in section 73 of the above law, the State Attorney-General has rendered an opinion from which the following is abstracted:

" In my opinion the proper and only lawful construction which can be placed on section 73 of the Public Health Law is that all damages and injury to the owner of any property affected by changes required to be made to comply with the rules of the Department of Health must be ascertained and paid prior to the taking possession of the property, and is a prerequisite to the enforcement of said rules in all cases except such as are a nuisance in and of themselves, in which cases the Department of Health would have power and authority outside of sections 70, 71 and 73 to abate the same. Any other construction would to my mind render the law unconstitutional. In brief, I am of the opinion that the State Department of Health, * * * can make and promulgate rules regulating and controlling the use of premises surrounding the sources in all regards, and that a person violating any of these rules can be punished as provided by the penalties, but before such punishment can be inflicted, the corporation for whose benefit the rules are made and established must pay or tender to the owner of the property affected by the enforcement of such rules an amount equal to all damages for making the changes necessary."

LAKE MOHANSIC

NEW YORK STATE TRAINING SCHOOL FOR BOYS

Rules and regulations for the protection from contamination of the public water supply of the New York State Training School for Boys in the town of Yorktown, Westchester county.

RULES AND REGULATIONS

The rules and regulations hereinafter given, duly made and enacted in accordance with the provisions of sections 70, 71 and 73 of the Public Health Law heretofore set forth, shall apply to Mohansic lake, in the town of Yorktown, county of Westchester, and to all portions of the drainage area tributary to said lake, and to all streams, lakes, ponds and reservoirs whose waters form or are tributary to said lake and the sources of water supply of the New York State Training School for Boys.

The term "reservoir" whenever used in these rules is intended to mean and refer to any natural or artificial reservoir, lake or pond which stores or detains water that enters or may enter the public water supply of the New York State Training School for Boys. The term "watercourse" wherever used in these rules is intended to mean and refer to any spring, stream, ditch, gutter or other watercourse of any kind, the waters of which when running, whether constantly or occasionally, eventually flow, or may flow, into the public water supply of the New York State Training School for Boys.

Wherever a linear distance of a structure or object from a reservoir or from a watercourse is mentioned in these rules, it is intended to mean the shortest horizontal distance from the nearest point of the structure or object to the high-water mark of a reservoir, or to the edge, margin or precipitous bank forming the ordinary high water mark of such watercourse.

Privies Adjacent to any Reservoir or Watercourse

(1) No privy, privy vault, pit, cesspool or any other receptacle of any kind used for either the temporary storage or the permanent deposit of human excreta shall be constructed, placed or maintained with its nearest point within three hundred (300) feet of the highwater mark of any reservoir, or within two hun-

dred and fifty (250) feet of the edge, margin or precipitous bank of any watercourse of the public water supply of the New York State Training School for Boys.

(2) Excreta collected from privies, privy vaults, pits, cesspools or any other receptacles of any kind shall not be placed on the ground or buried in the soil within three hundred (300) feet of the high-water mark of any reservoir or within two hundred and fifty (250) feet of the edge, margin or precipitous bank of any watercourse of the public water supply of the New York State Training School for Boys.

(3) Whenever it shall be found that owing to the character of the soil or of the surface of the ground, or owing to the height of flow of sub-soil or surface water, or other special local conditions, the excremental matter from any privy or aforesaid receptacle or from any trench or place of disposal, or the garbage or wastes from any dump, may, in the opinion of the State Commissioner of Health, be washed over the surface or through the soil into any reservoir or watercourse, then the said privy or receptacle for excreta or the said trench or place of disposal or the said garbage or waste dump shall, after due notice to the owner thereof, be removed to such greater distance or to such place as shall be considered safe and proper by the State Commissioner of Health.

Sewage, House Slops, Sink Waste, etc.

4. No sewage or excremental matter from any water closet, privy, or cesspool shall be led, conducted, or discharged by any pipe, drain or ditch into any reservoir or watercourse of the public water supply of the New York State Training School for Boys, nor shall any such matters be placed, led, discharged or allowed to escape onto the surface of the ground or into the ground below the surface within three hundred (300) feet of the high-water mark of any reservoir, or within two hundred and fifty (250) feet of the edge, margin or precipitous bank of any watercourse of the public water supply of the New York State Training School for Boys.

5. No garbage, putrescible matter, house slops, bath water, kitchen or sink wastes, refuse or waste water from creameries, cheese factories, laundries, nor any polluted water or liquid of any kind shall be thrown or discharged directly or indirectly into any reservoir or watercourse of the public water supply of the

New York State Training School for Boys; nor shall any such liquid or solid refuse or waste be thrown or discharged upon the surface of the ground or into the ground below the surface within three hundred (300) feet of the high-water mark of any reservoir, or within two hundred and fifty (250) feet of the edge, margin or precipitous bank of any watercourse of the public water supply of the New York State Training School for Boys, or in any manner whereby the same may flow into any reservoir or watercourse of the public water supply of the New York State Training School for Boys.

6. No clothing, bedding, carpets, harness, vehicle, receptacle, utensils or anything that pollutes water shall be washed, rinsed or placed in any reservoir or watercourse of the public water supply of the New York State Training School for Boys.

Bathing, Animals, Manure, Compost, etc.

7. No person shall be allowed to bathe in any reservoir or watercourse of the public water supply of the New York State Training School for Boys, nor shall any animals or poultry be allowed to stand, wade or swim in said reservoir or watercourse, nor be washed therein.

8. No stable for cattle or horses, barn-yard, hog-yard, pig-pen, poultry house or yard, hitching place or standing place for horses or other animals, manure pile or compost heap shall be located, placed, maintained or allowed to remain with its nearest point less than three hundred (300) feet of the high-water mark of any reservoir, or within two hundred and fifty (250) feet of the edge, margin or precipitous bank of any watercourse of the public water supply of the New York State Training School for Boys; and none of the above-named objects or sources of pollution shall be so located, placed, maintained or allowed to remain in any position whereby the drainage, leachings or washings from the same may enter any such reservoir or watercourse without first having passed over or through such an extent of soil as to have been properly purified, and in no case shall it be deemed that proper purification has been secured unless the above drainage, leachings or washings shall have percolated through or flowed over the soil in a scattered, dissipated form, and not concentrated in perceptible lines of drainage, for a distance of not less than three hundred (300) feet from the high-water mark of any reservoir,

nor less than two hundred and fifty (250) feet of the edge, margin or precipitous bank of any watercourse of the public water supply of the New York State Training School for Boys.

(9) No human excrement or compost containing human excrement shall be placed, piled or spread upon the ground, or dug or buried in the soil, within a distance of three hundred (300) feet of the high-water mark of any reservoir, or within two hundred and fifty (250) feet of the edge, margin or precipitous bank of any watercourse of the public water supply of the New York State Training School for Boys; and no manure or compost of any kind shall be placed, piled or spread upon the ground within three hundred (300) feet of the high-water mark of any reservoir, or within two hundred and fifty (250) feet of the edge, margin or precipitous bank of any watercourse of the public water supply of the New York State Training School for Boys.

(10) No decayed or fermented fruit or vegetables, cider mill waste, roots, grain or other vegetable refuse of any kind shall be located, placed, maintained or allowed to remain in such places that the drainage, leachings or washings therefrom may flow by open, blind or covered drains or channels of any kind into any reservoir or watercourse of the public water supply of the New York State Training School for Boys, without first having passed over or through such an extent of soil as to have been properly purified, and in no case shall it be deemed that sufficient purification has been secured unless the above mentioned drainage, leachings or washings shall have percolated through or flowed over the soil in a scattered, dissipated form, and not concentrated in perceptible lines of drainage, for a distance of not less than three hundred (300) feet of the high-water mark of any reservoir or two hundred and fifty (250) feet of the edge, margin or precipitous bank of any watercourse of the public water supply of the New York State Training School for Boys.

Dead Animals, Offal, Manufacturing Waste, Etc.

(11) No dead animals, bird, fish or any part thereof, or any offal or waste matter of any kind, shall be thrown, placed in or allowed to pass into any reservoir or watercourse of the public water supply of the New York State Training School for Boys;

nor shall any such material or refuse be so located, placed, maintained or allowed to remain in any position whereby the drainage, leachings or washings therefrom may reach any such reservoir or watercourse without having first percolated through or flowed over the soil in a scattered, dissipated form, and not concentrated in perceptible lines of drainage, for a distance of not less than three hundred (300) feet of the high-water mark of any reservoir, or two hundred and fifty (250) feet of the edge, margin or precipitous bank of any watercourse of the public water supply of the New York State Training School for Boys.

Fishing, Boating and Ice Cutting

(12) No fish shall be taken from any reservoir, nor shall any person fish in any reservoir or through the ice upon the same, nor trespass upon the waters of any reservoir or the ice thereon, nor maintain or use any boat or boats thereon, except the officials or duly authorized employees of the public water supply of the New York State Training School for Boys in the exercise of their duties in the management and operation of the reservoirs.

No person or persons shall cut or remove any ice from any of the reservoirs which form or are tributary to the sources of the public water supply of the New York State Training School for Boys.

(13) No interment of a human body shall be made within three hundred (300) feet of the high-water mark of any reservoir, or two hundred and fifty (250) feet of the edge, margin or precipitous bank of any watercourse of the public water supply of the New York State Training School for Boys.

(14) The board of managers or other official body having charge of the New York State Training School for Boys, through its superintendent or other duly authorized official, shall maintain systematic and thorough inspection of the reservoirs, streams and of the entire drainage area tributary thereto, for the purpose of determining whether the above rules are being complied with. At least three such inspections shall be made each year, preferably about the first of the months of March, July and November, and such others as may be directed by the State Commissioner of Health. A notice of violation together with a copy of the rule violated shall be served on all persons who shall be violating the above rules and regulations at the time of the inspec-

tion, which shall be conducted in strict accordance with the procedure outlined in section 71 of the Public Health Law, and if the person served does not immediately comply with the rule or regulation violated, the State Department of Health shall be notified of such violation in a report of inspection which shall be submitted in writing to the State Commissioner of Health within twenty days from the completion of such inspection.

Penalty

(15) In accordance with section 70 of chapter 45 of the Consolidated Laws, the penalty for each and every violation of, or noncompliance with, any of these rules and regulations, which relate to a permanent source or action of contamination, is hereby fixed at $100.

The foregoing rules and regulations for the protection from contamination of the public water supply of the New York State Training School for Boys, Westchester county, N. Y., were duly made, ordained and established on the 22d day of April, 1909, pursuant to chapter 45 of the Consolidated Laws of the State of New York.

EUGENE H. PORTER,
State Commissioner of Health

Albany, N. Y., April 22, 1909.

These rules and regulations to be operative and valid must first be published at least once each week for six consecutive weeks in at least one newspaper in Westchester county, N. Y., and the affidavit of the printer, publisher or proprietor of each newspaper in which such publication is made, that the publication was so made, together with a copy of the rules and regulations, must be filed with the county clerk of that county.

The cost of each such publication, affidavit and filing must be paid by the New York State Training School for Boys.

MONTICELLO

Amendment to Rules

In the Matter of the Application for the revocation of the rules and regulations prohibiting bathing, boating and fishing in Kiamesha lake, the public water supply of the village of

Monticello, Sullivan county, N. Y., said rules having been adopted by the State Department of Health, January 9, 1908.

After a careful consideration of all the facts bearing on this question, fully set forth in a written decision which I have to-day rendered, it is

Hereby ordered, That the rules and regulations heretofore adopted for the protection of the water supply of the village of Monticello on January 9, 1908,* be changed and modified as to certain restrictions contained therein in Rule 15 against fishing and boating, so that the said rule shall be as follows:

Rule XV. Fish may be taken from the waters of Kiamesha lake and boating shall be allowed thereon under the following conditions:

1. No boating and fishing shall be permitted within 1,000 feet of the intake pipe of the water supply of the village of Monticello.
2. Buoys shall be set by the water board defining this limit and special notices posted.
3. The water board shall appoint a patrol officer during the boating and fishing season, to secure enforcement of these rules and regulations.
4. Boatmen may be required to secure permits, revocable if rules are violated, to use boats on the lake.

The foregoing modified rule and regulation for the protection from contamination of the public water supply of the village of Monticello, Sullivan county, N. Y., was duly made, ordained and established on this 30th day of April, 1909, pursuant to the provisions of the Public Health Law, constituting chapter 5 of the Consolidated Laws of 1909.

EUGENE H. PORTER,
State Commissioner of Health

These rules and regulations to be operative and valid, must be published as required by law and the affidavit of publication filed with the county clerk of Sullivan county, the cost of said publication, affidavit and filing to be paid by the board of water commissioners of the village of Monticello.

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*See Twenty-ninth Annual Report, Vol. II, pp. 260-267.

INSPECTION OF VIOLATIONS OF RULES FOR THE PROTECTION OF WATER SUPPLIES

With some sixty-seven water supplies in the State under the protection of rules and regulations enacted by the Department, it is expected that with the natural growth of rural population on these many watersheds there will continually arise cases of pollution which will call for action of the local water boards or water companies in their removal, and in many of these cases it will be necessary for these local water boards or companies to refer them in turn to the State Department of Health before they can be successfully removed. The inspection of the violations and the issuance of necessary orders to local boards of health for their removal form an important part of the work of the Engineering Division in relation to this class of public water supplies, and during 1909 violations in the following cases were reported and examined into by the Engineering Division and the necessary orders issued to local boards of health: Auburn, Hudson, New York, Peekskill, Saratoga Springs, Yonkers.

Attention was called in last year's report [see 29th (1908) Annual Report, Vol. II, pp. 279–280] to a general order issued in June to some forty-seven municipalities of the State whose water supplies are protected by rules and regulations, calling for a thorough examination of the watersheds furnishing the source of these supplies and a report of all violations of these rules which were found to exist, and a list of these municipalities to which such rules were issued was then given. The results of this action were very satisfactory for, although it entailed considerable work of the Engineering Division in verifying the violations reported as a result of the many inspections of the local authorities, it revealed a very large number of violations, many of which were potentially, if not actively, dangerous, and enabled the Engineering Division to incidentally determine the extent and character of polluting sources upon the various watersheds and to classify these supplies with respect to their sanitary quality and general purity.

Only five out of these forty-seven water boards or companies, viz.: Cobleskill, Kingston, Mechanicville, Rome and Walton, failed to furnish the necessary information required by these orders; and although subsequent notices have been sent them, they have so far failed to properly or fully comply with the original order and for this reason these cases will be made the subject of further investigation and action.

SPECIAL INVESTIGATION OF PUBLIC WATER SUPPLIES

By far the larger number of water supplies in the State are not protected by rules and regulations enacted by the State Department of Health. Many of them are underground supplies or supplies taken from watersheds remotely situated and uninhabited and the water from which is free from pollution and generally safe. Many of these supplies, however, are not so favorably situated and are subject to some pollution and are consequently of questionable quality. How best to improve the quality of these supplies in the absence of water rules has always been one of the problems before the Department.

It was considered that as a prerequisite to any material progress toward the improvement of these supplies it would be necessary to make an investigation of the sanitary conditions of the sources from which these supplies are derived. Accordingly, in 1908, a special investigation* was undertaken by the Engineering Division of a selected number of 225 surface water supplies in the State not protected by rules and regulations, and having for its object, first the securing of information concerning the physical features of each supply and the sanitary condition of the watershed from which it was derived, and secondly, the preparation of a report based upon the knowledge thus secured setting forth the findings and conclusions concerning the sanitary quality of the water furnished and recommendations concerning any changes or improvements which it would be desirable or necessary to carry out.

The practical results of this manner of investigating and reporting upon many of the supplies of the State which have not received the proper attention which they should have received were shown by experience to be so satisfactory during 1908 that this work was continued during the year 1909. In my report to you of last year there was presented the list of municipalities the water supplies of which it was possible to investigate and report upon during 1908. During the past year it was possible to investigate and report upon some twenty-five more of the original list of municipalities as follows:

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* See 29th Annual Report, Vol. II, p. 281.

Amsterdam,
Berlin,
Cairo,
Camden,
Canandaigua,
Castile,
Cazenovia,
Deansboro,
Deposit,
Florida,
Haverstraw, West Haverstraw and Stony Point,
Margaretville,
Port Jervis,
Sag Harbor,
Saugerties,
Sidney,
Sidney Center,
South Glens Falls,
Suffern,
Walden,
Washingtonville,
Waterloo,
West Carthage,
White Plains,
Williamsville.

Copies of the reports covering these investigations have, in each case, been sent to the authorities in charge of the water supply and to the local board of health. These reports are herewith presented.

AMSTERDAM

Albany, N. Y., *December* 7, 1909.

Eugene H. Porter, M.D., *State Commissioner of Health,*
Albany, N. Y.:

Dear Sir: — In accordance with your directions I beg to submit the following report covering an examination of the present condition of the water supply of Amsterdam, with special reference to the occurrence of typhoid fever which was reported as being somewhat prevalent in that city at this particular time.

On December 3, 1909, I visited Amsterdam and conferred with the health officer, Dr. James S. Walton, and with the superintendent of water works, Mr. James R. Snell, and discussed with them the occurrence of typhoid, the sanitary conditions of the watersheds at present in use, and as to the progress in the construction of the new pipe line to deliver an increased supply from Hans creek. Following this visit, I detailed Mr. C. F. Breitzke, Assistant Engineer, to make a thorough inspection of the sanitary conditions of all watersheds except Hans creek, which is known to be largely a wilderness and practically free from pollution, with special reference to the existence of violations of the water rules or other conditions dangerous to the purity of the supply.

The water supply of Amsterdam is obtained chiefly from Hans creek at a point about fifteen miles northeast of the city. This is supplemented by water diverted from Rodgers and McQueen creeks from a point about four miles northwest of the city.

Amsterdam at present has a population of about 30,000, practically all of whom are directly supplied from the public water works, which are owned by the city and are under the control of a board of water commissioners.

There are about forty-five miles of mains ranging from four inches to twenty-four inches in diameter. The average daily consumption is six million gallons, one million gallons of which are used for manufacturing purposes. There are 3,660 service taps, but with the exception of manufacturing plants and a few churches, none of these are metered. The water is furnished by gravity under a pressure of from eighty to one hundred pounds per square inch.

The water works were installed in 1882, at which time an impounding reservoir was built on Bunn creek about two miles north of the city. This supply was supplemented by diverting water from Rodgers and McQueen creeks through an 18-inch vitrified pipe conduit discharging into Bunn creek about three-fourths of a mile above the reservoir. About 1889 this supply had become inadequate and an additional supply was secured from Hans creek in the town of Providence at a point about fifteen miles northeast of the city and diverted through a 20-inch vitrified pipe conduit twelve miles long into Bunn creek at a point about two miles above the reservoir. About ten years ago Kellogg reservoir was built on Bunn creek about two miles above the lower reservoir to serve as a high level reservoir.

Recently on account of the increase of population on its watershed Bunn creek has been abandoned as a source of supply and an additional conduit of 30-inch iron pipe, now almost entirely completed, has been built from Hans creek. While Bunn creek has been abandoned the reservoirs on it are now being used as distributing reservoirs, Bunn creek being diverted through a new channel around Kellogg reservoir, and under the city reservoir through a 36-inch iron conduit. Kellogg reservoir thus receives water only from Hans creek and serves both as a high level distributing reservoir and as a small storage reservoir supplying the city reservoir through a conduit. About three-fourths of a mile above the latter reservoir the conduit from Rodgers and McQueen creeks enters the conduit just referred to, and consequently the water in the city reservoir is a mixture of water from Hans creek and from Rodgers and McQueen creeks.

On Hans creek there are three storage reservoirs and an intake dam. The largest of these is Glen Wild reservoir, located on Steele brook, having a storage capacity of 1,200,000,000 gallons, practically all of which is available for water supply. It has an earth dam with a concrete core wall, 63.5 feet high, 14.5 feet wide at bottom, and 3 feet wide at top. This reservoir has an area of 180 acres and has a depth of 10 to 41 feet, with an average of 26 feet. South of Glen Wild reservoir and on the main stream is Cook's reservoir, having a storage capacity of about 100,000,000 gallons, an area of 53 acres, and a varying depth of 3 to 24 feet, averaging 10 feet. In addition to these reservoirs, a concrete dam was built at the outlet of Round pond, raising its level 12 feet and flooding an area of 55 acres, thereby creating a storage of about 100,000,000 gallons.

The water from these reservoirs flows along the bed of the stream to a masonry intake dam located just below the junction of Steele brook with Hans creek. This dam is 10 to 12 feet high and stores about 5 feet of water. It is provided with two gate houses, one for the old 20-inch conduit having a carrying capacity of 5,000,000 gallons per day and one for the new 30-inch line with a carrying capacity estimated at 15,000,000 gallons per day.

Hans creek above the intake works has a drainage area of 24.65 square miles, practically all of which is thickly wooded. The only buildings on the watershed are those at the caretaker's residence located just below Cook's reservoir. The topography is rather steep and the soil is sandy. Along the edges of the streams, however, there is a flat strip of marshy land, which accounts for the high color and high vegetable content of the water.

The Rodgers and McQueen creeks supply comes from a watershed about 3.5 square miles in area having a population of 92 persons or 26 per square mile. About 1.1 square miles of the drainage area is the upper portion of Rodgers creek which is diverted through a ditch and a conduit into the west branch of McQueen creek. The land is quite flat near the junction of this stream with the main portion of McQueen creek and a small dam and a trench at this point diverts the water about 1,000 feet easterly to an 18-inch conduit which carries the water in a southeasterly direction as described above.

The city reservoir has a capacity of 100,000,000 gallons or about 16 days' supply. It has a stone dam and is uncovered. The area of water surface is about 16 acres and depth varies from 6 to 50 feet. Up to four years ago considerable trouble was experienced from algae growths, but these are now kept under control by frequently drawing off the bottom layers of water through a mud pipe and by the occasional use of a copper sulphate in the proportion of 1 pound per 1,000,000 gallons of water in the reservoir.

Kellogg reservoir is located at the end of the Hans creek conduits and has a capacity of about 4,500,000 gallons. It has a masonry dam and is uncovered. Its water surface is about 3 acres in area and its depth ranges from 3 to 12 feet with an average of about 6 feet.

Concerning the relative yield and capacities of the various streams and reservoirs the superintendent's report to the Water Commissioners for the year ending April 30, 1909, contains the essential information. From this report it appears that Glen Wild reservoir was full and overflowing April 27, 1908. From that time and until October 26, 1908, on account of the great drought prevailing during the entire season, the normal flow of Hans creek below the reservoirs being nearly nil most of the time, and also from the fact that the McQueen and Rodgers supply was entirely shut off until late in the season, the Glen Wild reservoir supplied the city with nearly all the water that was used and practically all that the pipe line could carry from Hans creek to the city. The lowest point it reached was 16 feet 6 inches below the flow line, leaving in the reservoir 400,000,000 gallons, or as much water as the vitrified conduit line could bring to the Kellogg reservoir in 80 days exclusive of intervening rainfall flow in Hans creek, and the storage contained in both Cook reservoir and Little Round lake. This reservoir filled up again during the winter of 1909, and on April 20, 1909, there was flow again over the spillway.

On account of the small amount of water flowing in Hans creek during the drought in the summer months in 1908, Cook reservoir was practically empty during the entire season. On October 30, 1908, however, it was again overflowing the spillway.

Little Round lake was full and running over until June 22, 1908. From that time until November 6, 1908, it was drawn down but three feet leaving at least nine feet of water for the use of the city in the lake at the close of one of the worst seasons of drought ever experienced in the State.

From the above it is evident that ample supply can be obtained from the Hans creek watershed to supply the needs of the city of Amsterdam for some time to come. Up to the present time, however, the amount which could be drawn from this source has been limited to 5,000,000 gallons per day, the maximum carrying capacity of Conduit No. 1. Conduit No. 2, which was designed to have a carrying capacity of 15,000,000 gallons, is now almost completed and will be in service in a few weeks. Mr. H. M. Geer, the Engineer for the Board of Water Commissioners in his reports to that body, has pointed out that this supply can be obtained every day in the year by a further extension and enlargement of the existing storage capacity in Hans creek drainage area.

No water was derived from the Rodgers and McQueen system from October, 1907, until early in July, 1908, when the limited carrying capacity of the Hans creek conduit and the drought then prevailing made this action imperative. During the period of its nonuse, however, it appears that several sanitary inspections of this watershed were made and some of the worst conditions remedied. Plans are now under consideration for a further improvement of this supply.

An inspection of this watershed was made on December 6, 1909, by Mr. C. F. Breitzke of this Department. During this inspection a canvass was made of every house on the watershed with respect to the number of people living at each, the existence of typhoid fever, and the sanitary conditions with respect to the possibility of pollution of the streams. There is no village or hamlet on the watershed. In all there are twenty-nine isolated farm houses having an aggregate population of ninety-two persons, or twenty-six per square mile. In a number of cases privy vaults were found provided with galvanized iron receptacles and other evidence that the Amsterdam board of water commissioners have been enforcing the rules and regulations enacted by this Department for the protection of their water supply.

Violations of the rules were, however, found in the following nine cases:

1. *Wm. A. Stearns*, owner, *Thomas Carrig*, tenant; place located on the south side of first highway south of Perth leading west from the Amsterdam-Perth highway about 0.6 miles from that highway. Violation consists of dirty barnyard being located at edge of McQueen creek. (Other insanitary conditions have existed, but have been remedied by Amsterdam board of water commissioners.)

2. *J. T. Buchanan*, place located on east side of road referred to in (1) about a third of a mile south of the Johnstown-Perth highway. Violation consists of stable and privy being located 15 ft. and 40 ft., respectively, from edge of a precipitous bank and a dirty barnyard being located on sloping ground at edge of small stream.

3. *Edward Vosburgh*, place located on west side of second highway west of Perth leading in a southwesterly direction from the Johnstown-Perth highway, about one-half mile from that highway. Privy is located at the edge of a precipitous bank of Rodgers creek and wash water and sink waste are thrown on the ground about twenty-five feet from edge of bank.

4. *John C. Buchanan*, place located on east side of east highway leading from Johnstown-Perth highway to Aiken, about a mile south of that highway. Hog yard is located at edge of small stream tributary to the Rodgers creek supply.

5. *Louis Twardzik*, place located on east side of first highway west of Perth leading south from the Johnstown-Perth highway about one-third of a mile south of first highway south of Perth leading west from Amsterdam-Perth highway. Eight people live

here. Stable and manure pile are located forty feet and thirty feet respectively and wash water is discharged on ground about fifty feet from edge of a precipitous bank of Rodgers creek a half mile above intake.

6. *Jacob Briskie,* place located across the highway from (5), Eight people live at this place. Stable is located forty feet from the edge of precipitous bank of Rodgers creek.

7. *Charles Frust,* place located on north side of Johnstown-Perth highway about three miles west of Perth. Privy is located at edge of a ditch leading to a watercourse tributary to Rodgers creek.

8. *Clinton Hopkins,* place located on south side of Johnstown-Perth highway about a mile west of Perth. Privy is located about 120 feet from watercourse.

9. *Felix Conte,* place is located on west side of first highway west of Perth leading south from the Johnstown-Perth highway about a mile south of that highway. Privy without a vault is located on sloping ground about 150 feet from a stream tributary to McQueen creek and so situated as to be liable to pollute the same.

Samples of the water were taken at the time of the inspection from Rodgers creek, McQueen creek, Hans creek conduit, and a tap in the city and were sent to the State Hygienic Laboratory for bacteriological analysis. The results of the analysis of these samples together with those of other results of chemical and bacteriological analyses made during the past two years are given in the table on page 374.

These analyses show on the one hand that the Hans creek supply is high in color and vegetable organic matter qualities inherent in its swampy origin, but otherwise comparatively free from pollution and contamination. On the other hand the McQueen and Rodgers creek supply is quite low in vegetable organic matter but gives evidence of considerable contamination, fecal organisms having been found present in all 10 c.c. inoculations made, in all but one of many 1 c.c. inoculations, and in all cases in a portion of the 1 c.c. inoculations tested, showing that the contamination is large in amount.

Since a number of reports have been received at the Department alleging that typhoid fever was unduly prevalent in the city, careful inquiry was made of the health officer concerning the actual cases that had developed in the last two months or were in existence at the time of my visit. I was assured that a careful record of all reported cases was being kept and that during the months of October and November twenty cases were reported to the local board of health. I was further assured that careful inquiry had been made of the resident physicians and that it was the opinion of the health officer that these twenty cases represent a complete list of all that have occurred during this interval.

Assuming the correctness of these figures and estimating the population of Amsterdam to be approximately 30,000, these cases represent a monthly prevalence of the disease for this season of the year of from thirty to thirty-five per 100,000 of population. Considering the seasonable variation of the prevalence of typhoid fever, and assuming ten cases to one death, these figures correspond to a death rate of between twenty-five and thirty per 100,000 per year.

It is evident, then, that the prevalence of typhoid fever during these two months at Amsterdam, though somewhat in excess of the average rate for the State, can hardly be considered to approach in any way an epidemic. In fact, it is considerably less than the typhoid rate in a number of municipalities in the State provided with fairly satisfactory water supplies. It is, however, in excess of the average for the State and points out clearly that conditions exist in the city which are responsible for this excess, and, further, that in all probability, and in view of the unsatisfactory character of a part of the public water supply, this excess may be due in a measure to possible infection of this portion of the public water supply.

As a result of this investigation and in view of the foregoing, I beg to submit the following conclusions and recommendations:

1. Whereas the prevalence of typhoid fever in the city of Amsterdam has not reached the proportions of an epidemic, it appears, however, to be somewhat above the normal as compared with the average prevalence of typhoid fever in the State.

2. The quality of the water supply obtained from McQueen and Rodgers creeks as indicated by the large population on and the inspection made of the watershed, and as shown by analyses

of samples collected at different times is subject to considerable pollution and contamination.

3. Although other factors may be active in causing the excess of typhoid fever at Amsterdam, it is probable that the portion of the water supply obtained from McQueen and Rodgers creeks is also partly responsible for this excess, and its use would be a continued menace to the city.

4. It appears from analyses and from what is known of conditions on the watershed of Hans creek that a safe and wholesome water supply is being obtained from this source. Considering that an additional conduit having a capacity of fifteen million gallons per day has been constructed it appears that Hans creek is able to supply the needs of the city of Amsterdam for many years to come.

5. Considering the ample supply of wholesome water now obtained from Hans creek and considering the large population on the watershed and the polluted character of McQueen and Rodgers creeks, it is desirable to abandon these streams as a regular source of water supply and to rely entirely for this on Hans creek. If not abandoned, all violations should be removed.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

BERLIN

On August 3, 1909, a letter was received from Dr. B. L. Sweet, health officer, calling attention to the prevalence of typhoid fever at Berlin and to insanitary conditions on the watershed, and asking that the Department send a representative to investigate the water supply. Such investigation was accordingly made on August 10, 1909. The report thereon was as follows:

ALBANY, N. Y., *September* 22, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of an investigation of the public water supply of the village of Berlin.

Berlin is an unincorporated village in the northern part of the town of Berlin, Rensselaer county, on the Little Hoosic river, about fifteen miles east of Troy. It is a station on the Rutland Division of the New York Central Railroad lines, thirty-four miles north of Chatham.

It has a population of about 800, half of whom are directly connected with the public water supply works. The water is furnished by the Berlin Water Company of which Mr. James C. Cowee, 51 River street, Troy, N. Y., is president, and Mr. Tracy D. Taylor, Berlin, N. Y., is superintendent and general manager.

The original water works were installed in 1885 and consisted of a small reservoir fed by pipes from two springs which in this report, for convenience of reference, will be designated as spring "A" and spring " B," and about 3,500 feet of 2-inch and 2½-inch pipe. In 1904 the reservoir was enlarged and 4-inch and 6-inch mains laid throughout the village. In 1908 a small impounding reservoir was built and the water from it piped directly to the distributing reservoir through a 4-inch pipe.

Briefly, these works at the present time consist of two springs, an impounding reservoir, a distributing reservoir and about two miles of pipe, varying from 1 inch to 6 inches in diameter. There are 66 service taps, none of which are metered. The average daily consumption is estimated at 80,000 gallons, of which 25,000 gallons are used for domestic consumption, and 40,000 and 15,000 gallons, respectively, for water power by a shirt factory and a " flower stem " factory, respectively. The water is distributed by gravity under an average pressure of 85 pounds per square inch.

Spring "A" is a small spring brook fed by several springs located on a wooded hillside about half a mile west of the village. This brook is dammed by a small earthen dam in the face of which there is a small intake box, the front and sides of which are provided with wire netting, the water flowing through a 4-inch siphon under a valley to the reservoir on the opposite side.

Spring " B " is located about half a mile southwest of the village at the foot of a hill used as pasture land. The soil is sandy and gravelly. The water is collected in a loose rubble masonry vault, 20 feet long, 6 feet wide and 3 feet deep, the water flowing from this to the reservoir through a 1½-inch pipe by gravity. At the time of the inspection, owing to the dryness of the season, this spring was dry. This spring is covered over with a triangular wooden roof and is probably free from surface wash.

The chief supply, however, is obtained from a small impounding reservoir on a small spring brook with a drainage area of about 100 acres at a point about one mile southwest of the village. This reservoir is uncovered and has a concrete dam about 100 feet long in an earthen bank. This dam is about 1 foot wide and is from 6 feet to 10 feet deep reaching down to hardpan and bed rock to hold back the ground water flow in a gravity soil. The water stored covered an area of about 1,000 square feet to an average depth of about 2½ feet. Near the outlet pipe the water was 4½ feet deep. The storage capacity of this reservoir is estimated at 18,000 gallons. In addition to supply from brook it also is supplied directly from some springs.

The distributing reservoir is on a side hill just west of the village. It is uncovered. One side consists of a concrete dam 1 foot wide, with two wings 50 feet and 75 feet long, respectively, backed by an earth embankment; two sides are earth embankments; and the fourth is excavated out of the hill. The reservoir is 220 feet long, 140 feet wide, and has a depth varying from zero to 12 feet, with an average of 5 feet. The capacity is estimated at one and one-quarter million gallons.

In dry weather the water supply is supplemented by a 3-inch pipe flowing into the reservoir from Hammond creek at a point about three-fourths mile southwest of the village. Above this intake the stream has a watershed of about one and one-half square miles with a population of about fifty. The soil is rocky and gravelly and the topography is rather steep. The stream has two branches. The west branch has its source in Kendall pond and flows in an easterly direction for about three-fourths mile. The east branch has its source about one-half mile south of Kendall pond, flows east slightly north for about three-fourths mile and then north, joining the west branch at about 250 feet above the intake. On the east branch there are five houses located immediately above the intake. There are also a number of cottages at Kendall pond, which, however, were not inspected. The following cases of pollution were found:

1. John Toker place, located just above intake of supplementary supply from Hammond creek. Here there is a hen house at the

edge, stable and manure pile 20 feet, a privy about 35 feet, and a pig-pen 50 feet from the stream, on side of hill sloping toward the creek.

2. John McGann place, located about 350 feet above supplementary intake. Pig-pen and stable are located about 30 feet from Hammond creek.

3. On property owned by water company tenanted by Avery Westcott, located just below impounding reservoir on a small stream tributary to the east branch of Hammond creek, there is a hen house over the stream, a stable and privy in springy ground at the edge of the stream, and the kitchen door of the house but a few feet from the stream with evidence of kitchen slops and wash water on the ground near it. Across the street in the bed of the main stream refuse is dumped.

4. Frank Maxson place, located about two-fifths mile above supplementary intake. There is a privy overhanging main stream and a manure pile, stable and barnyard with hog-pen on path of drainage of a small stream tributary to the other.

At the time of the inspection, water was being taken from Hammond creek and flowing into the reservoir. On the inspection trip, however, the superintendent of water works, after he had been over the watershed with our assistant engineer, Mr. C. F. Breitzke, raised the intake pipe out of the water so as to allow no more water to enter.

It appears that from information furnished by the health officer, Dr. B. L. Sweet, that four to eight cases of typhoid fever have occurred in the village every year from August to November. This epidemic period seems to have been coexistent with that in which the water supply was supplemented from Hammond creek.

Samples of the water from a tap in the village and from Hammond creek, near the supplementary intake, were taken on August 13, 1909, by the health officer, Dr. B. L. Sweet, and sent to the State Hygienic Laboratory for chemical and bacteriological analysis. The results of this analysis are given in the table on page 374.

These results indicate beyond a doubt that Hammond creek is seriously polluted and is unfit and dangerous for use as a source of potable water. The analysis of the sample taken from the tap shows clearly the effect of the contamination which it appears from the inspection of the watershed must have come from the admixture of water from Hammond creek up to three days before the sample was taken.

In view of the foregoing I beg to submit the following conclusions:

1. That from the inspection of the watershed, the main source of water supply of the village of Berlin is not subject to contamination.
2. That at the time of the inspection this water supply was unquestionably polluted owing to admixture of water from Hammond creek.
3. That the practice of supplementing the supply with water from Hammond creek at its present point of intake is dangerous, and should be discontinued and steps taken to either move the intake up-stream above contaminating sources or to develop some other source of supply.

On the east branch of Hammond creek about one-half mile above the present location of the intake of the supplementary supply and above all points of pollution referred to in the foregoing report, the stream flows in a narrow gorge and it is possible that a dam and small storage reservoir may be economically constructed at this point.

I recommend, therefore, that a copy of this report be sent to the water company and that they be urged to give most careful consideration to the conclusions and recommendations contained therein, and to take any necessary action in accordance with them.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

CAIRO

ALBANY, N. Y., *February* 1, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report of an investigation made by the Engineering Division in the matter of public water supply of the village of Cairo.

Cairo is an unincorporated village in the town of Cairo, located on the Shingle Kill, a stream tributary to Catskill creek. It is a terminal of the Catskill Mountain Railway and is a well-known summer resort, having a population of about 1,000 during the summer months.

The water supply of Cairo is obtained from Tepesticook brook at a point one mile west of the village and is furnished by the Cairo Water Company of which Mr. F. G. Walters is vice-president and superintendent and Mr. M. A. Chadderdon is secretary.

Tepesticook brook is tributary to Catskill creek and has a drainage area above the intake of 1,200 acres, having a resident population of about 60. For the most part the slopes are rather gentle. A considerable portion of the watershed is meadow land. The rest is rocky and wooded. Generally speaking, the houses are at a distance from the stream and this watershed is an excellent gathering ground for a water supply.

The water works were installed in 1898, and consist of one impounding reservoir with gatehouse, and about three miles of mains, ranging from 4 inches to 12 inches in diameter. The reservoir is located on one side of the stream, the water being diverted into it through a 12-inch pipe, with a valve which is closed when the water in the stream is turbid. The reservoir has a stone dam and is uncovered. It has an area of about 2.5 acres and an average depth of about 12 feet. Its storage capacity is estimated at 11,500,000 gallons.

Cairo has a resident population of 500, about 75 per cent. of which is directly furnished from the public supply. None of the taps are metered, but the average daily consumption during the summer months is estimated to be about 60,000 gallons. The water is supplied by gravity under an average pressure of 45 pounds per square inch.

The examination into this water supply was made on July 7, 1908, by Mr. C. F. Breitzke, Assistant Engineer. The reservoir at that time was in first class condition. The water was clear and there was no evidence of mud along the sides. No trouble had been experienced from algae growths.

An inspection was made of the watershed. With the exception of two places the houses were well back from the stream. One of these places was the Miller farm which is immediately above the reservoir where a privy and barnyard are a menace to the purity of the supply. The other was the White farm, where a privy stood but a few feet from the stream at a point above one-half mile above the intake.

Samples of water for sanitary analysis were taken from a tap in the village at the time of the inspection and sent to the State Hygienic Laboratory. The results of this analysis in parts per million are given in the table on page 374.

The nitrogen figures in the analysis are higher than what would be expected in a normal water and B. Coli were found present in all cases. These figures indicate a slightly polluted water and show the need of taking measures to abate all insanitary conditions affecting the purity of the water supply.

In view of the foregoing, therefore, I recommend that the attention of the Cairo Water Company be called to the insanitary conditions existing on their watershed and that they be advised that:

1. A thorough inspection of the watershed above the intake point of the stream from which their water supply is obtained, should be made and measures taken to remove all existing sources of pollution and to guard against their recurrence.

2. A careful oversight maintained over all houses on the watershed. Inspections should be made regularly and if these reveal any cases of typhoid fever, precautionary measures should be taken at once to close up all channels of infection and spread of that disease.

3. In case any difficulties are experienced in removing sources of pollution or it is otherwise found impracticable to adequately

cultural purposes, much of it is wooded and its storage capacity is good. Generally speaking, the watershed is an excellent gathering ground for a water supply and ought to furnish Camden with an abundance of wholesome water.

The water works were installed in 1886 and consist of one impounding reservoir, two spring water collecting reservoirs, and about seven miles of main ranging from four inches to ten inches in diameter. The impounding reservoir was formed by building an earth dam across Emmons brook. It is uncovered, and has an area of about one-half acre. It is very shallow at its upper end but becomes deeper, having a depth of sixteen feet at the dam, and an average depth of ten feet, and an estimated storage capacity of 3,000,000 gallons. The spring water reservoirs have concrete walls and bottoms and are covered with wooden frame buildings. One is 40 by 20 feet; the other, 10 by 10 feet. The water is piped into each from springs and stands in each to the depth of 2 feet. They are at a higher elevation than the impounding reservoir, and are connected directly to the mains, no storage capacity being considered necessary.

Camden has at present a population of about two thousand five hundred, about 90 per cent. of which are supplied directly from the public water supply. There are about four hundred and fifty taps, none of which are metered. The average daily consumption is estimated at 170,000 gallons, and the water is supplied by gravity under an average pressure of about sixty-five pounds per square inch.

An inspection of the watershed, made on September 9, 1908, by Mr. C. F. Breitzke, Assistant Engineer of this Department, gave no evidence of direct sources of pollution. Samples of the water for sanitary analysis were taken and sent to the State Hygienic Laboratory. Samples also were taken by a representative of the laboratory on May 15, 1908, and on December 21, 1908, respectively. The results of these analyses in parts per million given in the table on page 374, indicate a water of fair sanitary quality at the times the samples were taken.

The analyses of May 15th and September 4th were from samples collected from a tap in Maloney's drug store; those of December 21st were from samples collected from a tap at the Whitney house.

In conclusion, therefore, I beg to recommend that a copy of this report be sent to the board of water commissioners of the village of Camden and that they be advised that —

1. At the time the inspection of the watershed was made, the water was of a generally satisfactory sanitary quality. There were few houses on the watershed. These were back from the stream and caused no direct pollution.

2. Inasmuch, however, as there are some houses on the watershed, a careful oversight of them should be maintained. Regular inspections should be made and, if these reveal any cases of typhoid fever, precautionary measures should at once be taken to close up all channels of infection and spread of that disease.

3. If at any time sources of pollution of the water supply are discovered, the removal of which cannot be accomplished by ordinary efforts of the water board, it should consider the question of application to this Department for the enactment of rules and regulations for the protection of their water supply.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

CANANDAIGUA

ALBANY, N. Y., *May* 19, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of an investigation made by the Engineering Division in the matter of the public water supply of the village of Canandaigua.

Canandaigua is an incorporated village located twenty-six miles southeast of Rochester at the foot of Canandaigua lake. It is a station on the Auburn Division of the New York Central railroad and is a terminal of the Batavia and Canandaigua branch of the New York Central railroad and of the Northern Central railroad. It also has connections with Rochester by trolley.

The water supply is pumped from Canandaigua lake at a point two miles south of the village and is furnished by the municipality. Mr. George R. Ellis is superintendent of the water works.

Canandaigua lake is one of the so-called Finger lakes. It is about sixteen miles long and on the average a little more than a mile wide, having an area of 18.6 square miles. Its principal tributary is the West river which enters it at its south end. The lake is located in a deep gorge, running from south to north a little to the east. Its shores are steep and the other streams discharging into it are for the most part short and rapid.

West river has a drainage area of about ninety square miles, nearly half of which is in the watershed of its largest tributary, Naples creek, which joins it about a mile south of the inlet to the lake. The main branch of the West river runs through the towns of Italy and Middlesex and has a population on its watershed of about two thousand five hundred. Naples creek is practically all in the town of Naples and has a population on its watershed of 2,500, about one thousand one hundred of which is concentrated in the village of Naples which is located at the end of a strip of flat ground adjoining Naples creek, about four miles southwest of the inlet to the lake. This low ground at the head of Canandaigua lake has an area of about eight square miles. The topography of the remainder of the drainage area tributary to Canandaigua inlet is steep and rugged and a large part is wooded and wild.

The rest of the watershed tributary to Canandaigua lake lies in the towns of Middlesex and Gorham on the east and in the towns of South Bristol and Canandaigua on the west. The topography varies from a rugged and steep shale formation in the southern part to a somewhat gentle rolling ground at the foot of the lake. Practically all of the slopes have been stripped of their timber. In the southern part the mountains come close to the water's edge and the watershed is narrow, the streams being short and rapid and for the most part dry in the summer time. On going north the watershed widens and the streams become larger and longer. The principal streams enter the lake on the west side at Foster, Menteth, Tichenor, and Hope Points; on the east side three streams enter at Cottage City; Deep Run creek enters at a point midway between Cottage City and Greens Landing; another stream flows in at Greens Landing, and another coming from

Reed Corners enters opposite Hope Point. This portion of the watershed has a drainage area of about eighty-five square miles with a population of about five thousand making a population on the whole watershed of about ten thousand.

The water works were installed in 1895 and consist of a pumping plant, one reservoir, and about twenty-five miles of mains ranging from one to sixteen inches in diameter. The water is pumped from the lake directly into the mains, the surplus being stored in the reservoir.

The pumping station is a brick building 30 by 70 feet, located on the west shore of Canandaigua lake about two and one-half miles south of the village. The intake consists of a 16-inch bend with a projection of 4 feet of pipe turned upward. It is located 500 feet from shore in 50 feet of water and is connected with the pumps by a 16-inch pipe laid along the bottom. The equipment consists of two 12 by 12-inch Gould tri-plunger pumps having an estimated capacity of 1,000,000 gallons per day, each gear connected with a tandem compound Corliss engine capable of developing 150 horsepower. In case of emergency a 14 by 14-inch Eames slide valve engine can be used. The pumps have a 12-foot suction and pump against an average head of 273 feet.

The reservoir is located about two and one-half miles south of Canandaigua village and about one-half mile west of the pumping station. It is rectangular, has concrete sides and bottom and is uncovered. It is 298 by 178 feet on top, 250 by 130 feet on the bottom, and is 12 feet deep, having a capacity of 3,800,000 gallons.

Canandaigua has at present a population of about seven thousand five hundred, practically all of which are directly connected with the public supply. There are 1,487 service taps, all of which are metered. The average daily consumption is 1,000,000 gallons of which about three hundred thousand gallons are used for other than domestic purposes. The water is furnished at an average pressure of 100 pounds per square inch.

An inspection of the shores of Canandaigua lake was made on September 14, 1908, by Mr. C. F. Breitzke, Assistant Engineer. A road runs along each side of the lake. These roads are close to the shore with the exception of a few points where the topography would not permit easy construction. Summer cottages have been built along the shore at every available point and in many places the privies and sink drains are at the water's edge. There are large settlements at Bristol Springs, Vine Valley and at Cottage City, the latter being about two miles south of the intake.

The chief danger, however, is from a number of cottages located within a quarter of a mile from the intake and near the stream entering at Hope Point. The Health Officer, Dr. O. J. Hallenbeck, however, has taken up the matter of preserving the purity of the water supply and has for several years been active in trying to improve conditions near the pumping station. Also through his efforts the steamboat lines plying up and down the lake have installed watertight compartments which are discharged at Canandaigua outlet.

Samples of the water were taken for sanitary analysis in March, July and September from a tap in the village. These were analyzed at the State Hygienic Laboratory and the results are given in the table on page 374.

These results indicate a water of good sanitary quality at the present time and are in accord with data obtained at the time the inspection of the watershed was made, which showed that the condition of pollution at the lower end of the lake is not serious from a practical standpoint.

The above statement is by no means intended, however, to intimate that pollution of a direct nature will not take place from the shore near the intake. A thorough inspection of the cottages south of the intake should be made, all sources of pollution removed and every precaution taken to prevent the contamination of the water supply.

Although this danger is not very great at the present time, the fact should not be lost sight of that Canandaigua lake is a summer resort and that the population along its shores is rapidly increasing.

This factor brings up immediately the question of the future protection of the water supply and unless filtration works are to be installed at a comparatively early date, it is clear that the board of water commissioners of the village of Canandaigua ought to start at once to restrict pollution on this watershed and to remove all sources of direct pollution at the lower end of the lake. This latter point brings up another important question — that of the desirability of enacting water rules.

Canandaigua lake is one of the bodies of water in the Finger lake district, some five of which are protected by water rules enacted by this Department. Whereas the protection of these lakes by water rules is a matter of serious consideration owing to their relatively large size, the numerous riparian rights involved, and the possible relatively high cost of removing and protecting them against pollution, which, under the Public Health Law, must be assumed by the water company or municipality whose supply is thus protected, it must not be forgotten at the same time that the present pollution is not great and that the cost of protection would be considerably less if water rules were enacted at the present time than if this pollution were allowed to go on, and water rules were not enacted until some future time.

I, therefore, recommend that this question of eliminating the present pollution and of protecting the water supply against future and accidental pollution be carefully considered as outlined in the above suggestions, especially in regard to the necessity and expediency of the board of water commissioners of Canandaigua applying to the State Commissioner of Health for the enactment of water rules and regulations for the protection of their supply for Canandaigua lake.

If effective measures against pollution are taken by the board of water commissioners, it would hardly seem necessary to filter this supply at the present time. It seems inevitable, however, that filtration will ultimately be necessary and the postponement of such time will clearly depend on the efficiency of protective measures instituted.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

CASTILE

ALBANY, N. Y., *February* 1, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR: — I beg to submit the following report of an investigation made by the Engineering Division in the matter of the public water supply of the village of Castile.

Castile is an incorporated village in the southeastern part of Wyoming county, thirty miles northwest of Hornell. It is located on Wolf creek, a stream tributary to the Genesee river, and is a station on the main line of the Erie railroad.

The water supply is furnished by the municipality and is obtained from springs about three and one-half miles southwest of the village, having a catchment area of about 600 acres, with a population of twenty. These springs are located in rolling farm land, which slopes back gradually in a large flat area about 20 per cent. of which is a wooded swamp. The soil is porous and a good water-carrying stratum, consisting of sand and gravel underlain by quicksand and clay.

The water works were installed in 1903 and consist of four collecting wells with pipes leading to a number of springs, a reservoir, and about nine miles of mains ranging from four to ten inches in diameter. The reservoir and collecting wells are all at the same elevation and all have concrete walls and bottoms. The reservoir is 60 feet in diameter and holds 12 feet of water. It is uncovered and has an estimated capacity of 250,000 gallons. The collecting wells are 13 feet deep and hold 12 feet of water. One has a diameter of 5 feet, the others have one of 7 feet. They are covered and are connected directly with the mains.

Castile has a population of about 1,000, of which 80 per cent. are directly supplied. There are 210 service taps, none of which are metered. The average daily consumption is estimated at 100,000 gallons, about half of which is used for domestic consumption. The water is furnished by gravity at an average pressure of eighty pounds per square inch.

An inspection of this watershed was made on September 22, 1908, by Mr. C. F. Breitzke, Assistant Engineer. With one exception the springs were found located on rolling farm land removed from all buildings. This spring is tributary to the collecting well nearest the village and is located in the bed of a stream receiving drainage from a hog pen and manure pile on a steep slope a short distance above. Inasmuch as all the water from this spring is piped into the collecting well, it is possible for drainage to enter it.

Samples of water were taken for sanitary analysis from a tap in the village and were sent to the State Hygienic Laboratory. The results are given in the table on page 374.

The results indicate a water of safe quality at the time the sample was taken. While the total amount of organic matter present is not great, it is slightly high for a ground water. This may be due, however, to the swampy catchment area tributary to the springs and incomplete elimination of the organic matter in the water in its passage through the ground to the springs or to algae growths in the reservoir. Generally speaking, this watershed is an excellent gathering ground for a public water supply both in quality and quantity.

In conclusion, therefore, I recommend that the attention of the board of water commissioners be called to the insanitary conditions existing near one of their springs and that they be advised to take measures to remove the pollution existing at that point. The dipping of water from this spring by the people living near it is a menace to the purity of the water supply and should be prohibited.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

CAZENOVIA

ALBANY, N. Y., *May* 18, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR: — I beg to transmit the following report of an investigation made by the Engineering Division in the matter of the public water supply of the village of Cazenovia.

Cazenovia is an incorporated village in the western part of Madison county, seventeen miles southeast of Syracuse, situated at the southeast end of Cazenovia lake on Chittenango creek. It is a station on the Elmira and Cortland branch of the Lehigh Valley railroad and has stage connections with the Chenango branch of the West Shore railroad.

The water supply is furnished by the municipality and is obtained from a small stream, springs, and driven artesian wells and is furnished to the consumers by the municipality. The impounding reservoir is a mile southeast of the village and has tributary to it a drainage area of 405 acres, with two houses upon it. The springs and driven wells are in the village.

The water works were installed in 1890, and consist of one reservoir, a spring, nine driven wells ranging from one inch to four inches in diameter, a pumping station, and about six miles of mains, ranging from four to ten inches in diameter. The reservoir is a V shaped affair, having an aggregate length of 700 feet and an average width of 150 feet. It can be drawn down 12 feet and has an estimated capacity of eight million gallons. It has an earth dam and is uncovered. The spring is located on a lot owned by the municipality on the southeast outskirts of the village and is piped directly into the mains. Four of the driven wells are located on the east bank of Chittenango creek. These are driven through hard-pan and are from thirty-three to thirty-five feet deep. The others are artesian. One is located near the spring mentioned above, the others are about a thousand feet south of the pumping station in low marshy ground. The pumping station located in the village on the east side of Chittenango creek is equipped with a Gould 8 x 10-inch triplunger pump, a water motor and a 15 h. p. electric motor. The chief source of power is water power obtained from Chittenango creek. During the summer months practically all the water is pumped.

Cazenovia has a resident population of about one thousand seven hundred and fifty feet and a summer population of 2,500, practically all of which are directly connected with the public water supply. There are 421 taps of which 316 are metered. The average daily consumption is estimated at 175,000 gallons. The water is supplied at an average pressure of 65 pounds per square inch.

An inspection of this watershed was made by Mr. C. F. Breitzke, Assistant Engineer, on September 7, 1908. On a stream to the east of and piped into the reservoir is a house with a privy on the edge of a steep bank a few hundred feet above the intake. The village spring is located on a lot adjacent to the Smith, Dean and Perkins properties, on each of which there is a privy on land sloping toward the spring. One driven artesian well is located on the Perkins property 40 feet from a privy.

Samples of the water were taken from a tap in the village for sanitary analysis on June 4, 1908, by a representative of the State Hygienic Laboratory. The results of this analysis are given on page 374.

While the total amount of organic matter indicated by this analysis is not high, it should be remembered that at the time the sample was taken, as is shown by the high mineral content, this supply is largely a ground water supply which should be free from organic impurities and is, therefore, of suspicious quality.

In summarizing the foregoing, it appears that as regards the quality and quantity of the water supply of the village of Cazenovia —

1. The reservoir can be made to furnish a supply of satisfactory quality. It is, however, too small for an adequate supply.

2. The auxiliary supplies from springs, artesian and driven wells are open to suspicion. Whereas these sources can be protected by the removal of certain privies, even after these corrective measures have been taken, local conditions are not such as to make these sources ones which can be recommended.

3. The village has evidently outgrown its supply and it seems inevitable that it should be supplemented by a supply from some suitable new source.

In view of the foregoing, therefore, I recommend that the attention of the board of trustees of the village of Cazenovia be called to the insanitary conditions existing on their watershed and to the above conclusions in regard to the quality and quantity of their supply; and that they be advised that as soon as practicable the present auxiliary sources of supply should be abandoned and a supplementary supply secured from a new source of unquestionable quality either by

1. Impounding some surface stream:

2. Developing some underground supply in a locality free from pollution; or by
3. Filtering water from Cazenovia lake.

Since the supply from the reservoir can be made of a satisfactory quality, it would seem expedient to retain this supply. To ensure the freedom of this supply from contamination, it is important that the privy a few hundred feet to the east of this reservoir be removed.

The question of an additional supply is a matter which will require some study and I recommend that the village of Cazenovia employ expert advice to determine which will be the best means of procuring an additional supply of sufficient quantity and satisfactory quality.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

DEANSBORO

ALBANY, N. Y., *August* 2, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report covering an investigation of the public water supply of the village of Deansboro.

Deansboro is an unincorporated village in the town of Marshall, in the southern part of Oneida county. It is located on Oriskany creek, about thirteen miles southwest of Utica, and is a station on the Utica division of the New York, Ontario and Western Railroad. It has a population of about 275 persons.

The water works are owned by the Deansboro Water Company of which Mr. C. B. Miller is secretary and treasurer, and Mr. A. J. Patterson, superintendent of water works. The water works were installed in 1896, an additional reservoir being added in 1903. They consist of a collecting well, one and one-half miles of water mains ranging from 4 inches to 8 inches in diameter, and two small equalizing reservoirs. There are about forty-five service taps, none of which are metered, supplying about 70 per cent. of the population. The average daily consumption is estimated at 100,000 gallons, of which 40 per cent. is used by the Mohawk Condensed Milk Company. The water is furnished by gravity under an average pressure of about sixty pounds per square inch.

The water supply is obtained from a small stream receiving the flow from two sets of springs located on two adjacent watersheds at a point about a half mile west of the village. One set of springs is on the Muncell property, the other on the Bishop property, the supply from the former being piped about 1,000 feet through a hill and joining with the stream on the latter property 800 to 900 feet above the collecting well. The Mohawk Condensed Milk Company owns the Muncell spring and the Deansboro Water Company the springs on the Bishop property, but both village and factory are supplied through the same mains.

The collecting well is 6 feet in diameter and 10 feet deep. The water flows from it directly into the mains, the surplus being stored in two earthen uncovered equalizing reservoirs about 100 feet x 35 feet x 11 feet, and 150 feet x 50 feet x 6 feet, respectively, located on the outskirts of the village and having a combined capacity of about 5,000,000 gallons.

An inspection of the watershed was made on September 2, 1908, by Mr. C. F. Breitzke, assistant engineer. The two sets of springs have a combined drainage area of about one-half square mile. The topography is of a gentle rolling character, consisting of small knolls and ravines. The soil is porous and the ground is full of springs. There is practically no wooded area, and the land is used chiefly for pasturing cattle which have access to the streams. The "Muncell" supply is obtained from a series of springs on a side hill dammed at a point about 100 feet below the springs. The water from the main spring on the Bishop property flows overground about 1,000 feet before being fenced off.

There were two families living on the watershed, but the houses are quite a distance from the streams and it is improbable that there is pollution of the supply by human sewage or barnyard drainage.

Samples of the water were taken for chemical and bacteriological analysis at the time of the inspection. The results of this analysis, together with those of samples collected recently by a representative of the State Hygienic Laboratory and by Dr. George R. Wright, the health officer of the town of Marshall, are given in the table on page 374.

From this table it appears that bacilli of the B. coli type were found present in every 10 c. c. and 1 c. c. inoculation made and consistently in the majority of 0.1 c. c. samples tested. The normal chlorine for this region is about 0.35. The analyses indicate an average of about 2.00. The number of bacteria per c. c. and the organic content of the water are rather high, all of which factors indicate a water, the purity of which is open to suspicion. It appears from the inspection of this watershed that this pollution of the water supply is due entirely to cattle having access to the streams.

While this type of pollution is not an actual menace to the health of the residents of Deansboro, it has a tendency to render the water supply unwholesome and from an esthetic point of view is exceedingly objectionable.

It is therefore evident that corrective measures of some kind should be taken by the Deansboro Water Company to prevent, as far as possible, the pollution of the water supply. Such an improvement can be readily made by enclosing the main springs by masonry walls to protect them from surface wash and by extending the pipe line directly to the springs. In case the small springs should not be adequate to supply the cattle, an overflow pipe from the enclosed springs can be provided or if need be, the pipe itself can be tapped and the cattle supplied from troughs. This improvement will not be expensive and will do away with the necessity of letting the water flow overground and receive pollution from cattle on its way from the springs to the collecting well.

In conclusion, therefore, I recommend that the attention of the Deansboro Water Company be called to the insanitary features associated with their supply and that they be advised that:

1. Steps should be taken to remove the pollution of the water supply by enclosing the main springs on the Bishop and the Mun-

cell properties with masonry walls and by extending the pipe line directly to the springs.

2. In case they have any difficulty with the owners of the land on which the above springs are located, in making arrangements to bring about the above improvement, to consider the matter of applying to this Department for the enactment of rules and regulations for the protection of their supply.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

DEPOSIT

On November 4, 1908, a request was received from the Deposit Water Company that the Department advise them as to the best means of furnishing their patrons with pure and wholesome water at all times. On December 11, 1908, an investigation of this supply was made by a member of the Engineering Division. A copy of the report on this investigation was sent to the water company and to the local board of health. The report was as follows:

ALBANY, N. Y., *January* 29, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of an investigation made by the Engineering Division in the matter of the public water supply of the village of Deposit.

Deposit is an incorporated village in Broome and Delaware counties located thirty-four miles southwest of Oneonta at the junction of Oquaga creek with the west branch of the Delaware. It is a station on the main line of the Erie railroad and one hundred seventy-four miles from New York by rail.

The water supply of Deposit is obtained from Butler brook at a point about two miles north of the village and is furnished by the Deposit Water Company. Mr. E. Frank Smith is president of the water company.

Butler creek is tributary to the Delaware river at the point of junction with it of Oquaga creek. It has a drainage area above the lower reservoir of the Deposit Water Company of about six square miles, and flows in a southerly direction. About two miles north of the village line the stream divides, one branch going to the northwest for a distance of about two miles along the road leading toward North Sanford, the other leading from the north east for about two miles along the road to China. There are two other branches both from the west, one about a half mile south of the junction of the two main branches near school house No. 27 and following along the road to Sanford, the other about a mile south and leading from a storage reservoir along a steep road leading to the Scofield farm. According to the Broome county atlas there are about thirty houses on this watershed.

For the most part the slopes are very steep and rugged and to a considerable extent consist of a compact sandstone formation. The slopes have been stripped of practically all their timber and the land is used largely for dairy purposes. This watershed, however, has good storage and, generally speaking, is naturally an excellent gathering ground for a public water supply.

The water works were installed in 1884. An additional reservoir with pipe line was built in 1907. The works now consist of two impounding reservoirs and about nine miles of mains ranging from four to ten inches in diameter.

The old reservoir is about a mile and a half north of the village and is located on the main channel of Butler's Brook. It has a masonry dam 150 feet long and 21 feet high. It has an area of about 5 acres and is quite shallow, and is now used only to supplement the supply obtained from the stream leading from the new storage reservoir.

The storage reservoir is located about two miles northeast of the village at a higher elevation than the old reservoir. It has an earthen dam with concrete core wall and is about 800 feet long. The reservoir is uncovered and has an area of 15 acres. It is quite shallow and at the time of the inspection was almost dry.

The intake is located on a small stream running from the storage reservoir at a point about 1,000 feet below it. The water is strained through a small bed of gravel about 10 feet square and 18 inches thick; after which it is collected in a small chamber and enters a 10-inch main.

Deposit has at present a population of about 2,500, about 60 per cent. of which are directly connected with the public supply. There are about 375 service taps of which 3 are metered. The average daily consumption is estimated at 330,000 gallons, of which 5,000 is used for manufacturing purposes and about 175,000 by the Erie railroad. The water is furnished to the consumers by gravity under an average pressure of 60 pounds per square inch.

A partial inspection of the watershed was made on December 11, 1908, by Mr. C. F. Breitzke, assistant engineer, and insanitary conditions were noted in a general way. On a steep bare slope north of the new reservoir are two farm houses within a few hundred feet of it. On the watershed tributary to the old reservoir some ten to twelve places were noted where privies, stables and manure piles, etc., were close to streams.

Samples of the water were taken for sanitary analysis on November 6, 1908, by a representative of the State Hygienic Laboratory. The results of this analysis in parts per million are given in the table on page 374.

These results indicate a water of somewhat questionable purity.

In conclusion, therefore, I beg to recommend that the attention of the Deposit Water Company be called to the insanitary conditions existing on their watershed and that they be advised that:

1. A thorough inspection of the two farms on the watershed of the new reservoir should be made and all sources of pollution removed.

2. A careful oversight over these houses should be maintained. Regular inspections should be made, and if these reveal any cases of typhoid fever, precautionary measures should be taken to prevent any further infection or spread of that disease.

3. Inasmuch as it is necessary to supplement the new source of supply with the old, a complete inspection of the entire watershed of Butler brook should be made and measures taken to move all privies back from the watercourses and to remove all existing sources of pollution and to prevent their recurrence.

4. In case any difficulty is experienced by the company in removing sources of pollution or it is otherwise found impracticable to protect their supply, that the company consider the question of application to this Department for the enactment of rules and regulations in accordance with sections 70 and 71 of the Public Health Law.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

FLORIDA

ALBANY, N. Y., *January* 26, 1909.

Hon. EUGENE H. PORTER, *Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report of an investigation made by the Engineering Division in the matter of the public water supply of Florida, N. Y.

Florida is an unincorporated village in the town of Warwick, Orange county, situated twenty-one miles southwest of Newburgh and seven miles southeast of Middletown. It is a station on a branch of the Erie railroad running from Goshen to Pine Island and is located on Quaker creek, a stream tributary to the Wallkill river.

The water supply of Florida is obtained from Glenmere lake at a point about one and one-half miles east of the village. The water is furnished to the consumers by the Florida Water Works Company of which Mr. Samuel Greene, Florida, N. Y., is superintendent.

Glenmere lake is a club-shaped body of water about one and three-tenths miles long, six-tenths of a mile at its widest part, and one-tenth mile at its outlet. It has an average width of three-tenths mile and an area of four-tenths square mile. The watershed is narrow, the lake and stream tributary to it being hemmed in by small hills. Its drainage area is consequently quite small, the whole area including the lake being only about two square miles. The lake at its lower end is about thirty feet deep. At its upper end the water is shallow and the shore marshy. The topography of the surrounding country is gentle. The watershed is sparsely settled and is used largely for agricultural purposes.

The water works were installed in 1892. The intake is about five hundred feet from the outlet of Glenmere lake. The intake pipe projects twenty-four feet out into the lake. It is laid along the bottom and has a bend with a short length of pipe turned upward. There are about four miles of pipe ranging from four inches to 10 inches in diameter and about one hundred service taps, none of which are metered.

The population of Florida is about seven hundred and fifty of which about seventy-five per cent. are connected with the public water supply. The average daily consumption is estimated at 25,000 gallons. The water is distributed by gravity under an average pressure of 35 pounds per square inch.

An inspection of this watershed was made on July 2, 1908, by Mr. C. F. Breitzke, assistant engineer. There are eight houses on this drainage area, having an aggregate population of about thirty persons. With the one exception of the Minturn place where there was a privy a few feet from a stream, these houses were back from the water-courses.

The shores of this lake are becoming popular as a summer resort. Camping and picnic parties visit its shores during the summer months and are a menace to the purity of the water supply obtained from it. Boating and bathing are a common form of amusement. One bathing place with bath-houses is located within a few hundred feet of the intake and although the general flow of the water in the lake will ordinarily remove the pollution from this source, yet owing to currents set up by the wind, contamination of the Florida water supply is liable to result from its proximity to the intake.

Samples of water for sanitary analysis were taken from Glenmere lake near the intake and were sent to the State Hygienic Laboratory. The results of this analysis in parts per million are given in the table on page 374.

Although these figures in general indicate a water of fair sanitary quality, the persistent presence of B. Coli in all of the 1 c.c. inoculations made, opens purity of this water to suspicion. While it is possible that this contamination may have been of an indirect nature, it is at the same time probable that the proximity of the bathing place referred to above and at which bathing was going on and had been previous to the time the sample was taken, may have been largely the cause of it. Pollution of this kind is particularly dangerous, owing to its recent and immediate nature, and every precaution should be taken to guard against it.

In conclusion, therefore, I recommend that the attention of the Florida Water Company be called to the undesirable features surrounding their water supply, and that they be advised that,

1. A complete inspection of the watershed of Glenmere lake should be made, and measures taken to remove all sources of pollution and to prevent their re-occurrence in the future.

2. It is imperative that measures should be taken to prevent bathing and to restrict boating and occupancy of the shore by pleasure seekers in the vicinity of the intake.

3. In case they experience any difficulty in removing sources of pollution or otherwise find it impracticable to protect their supply, to consider the question of application to this Department for the enactment of rules and regulations in accordance with sections 70 and 71 of the Public Health Law.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

HAVERSTRAW

ALBANY, N. Y., *June* 1, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR: — I beg to transmit the following report of an investigation made by the Engineering Division in the matter of the public water supply furnished by the Haverstraw Water Supply

Company to the villages of Haverstraw, West Haverstraw and Stony Point.

These villages are located in the northern part of Rockland county on the west side of the Hudson river, about twenty miles south of Newburgh. The West Shore railroad offers transportation facilities.

Haverstraw and West Haverstraw are incorporated villages having a population in 1905 of 6,182 and 2,348, respectively. Stony Point is unincorporated and consists of a number of settlements having an aggregate population of about 2,500 from October to May, and 3,500 during the rest of the year when the brickyards are in operation.

The public water supply at each of these places is furnished by the Haverstraw Water Supply Company, of which Martin A. Driscoll is president and superintendent. The water supplied is taken from two sources, one by gravity from a reservoir supplied by a small stream and five artesian wells near Thiells, about three miles west of Haverstraw; the other by pumping from Cedar Pond creek, at North Haverstraw. Ordinarily Haverstraw and West Haverstraw are furnished with water from the Thiells supply, and Stony Point from Cedar Pond creek. The mains of the two supplies, however, are connected, and at times Haverstraw and West Haverstraw are supplied from Cedar Pond creek.

Haverstraw and West Haverstraw have at present populations of about 6,500 and 2,500, of which 3,500 and 2,000 are supplied, respectively. The daily consumption is 300,000 gallons, 225,000 gallons of which are used at Haverstraw and 75,000 gallons at West Haverstraw. There are about sixteen miles of pipe — ranging from four inches to ten inches diameter — twelve at Haverstraw and four at West Haverstraw. The water is furnished at average pressures of 100 pounds and 60 pounds per square inch, respectively.

At Stony Point there is a population of about 2,000 people, about one-fourth of whom are supplied, and a population at the brickyards varying from 500 in winter to 1,500 in summer, all of whom are supplied. The company has about four miles of pipe at Stony Point under an average pressure of 70 pounds per square inch, and about two miles to the brickyards under an average pressure of 120 pounds per square inch. The average daily consumptions at these two places are 30,000 and 200,000 gallons, respectively.

The Thiells supply is taken from a small brook, supplemented by five artesian wells, the water from which flows overground into the stream at a point just above the reservoir. The reservoir has a masonry dam, is uncovered and has a capacity of 2.5 million gallons. Just above the reservoir there is a small basin provided with a sluice gate so that in time of turbid water all or part of the water from the brook can be diverted from the reservoir. The watershed is about three-fourths of a square mile in area. There are four houses on it, but all are back from the stream.

The water supply from Cedar Pond creek is taken at a point about four miles northwest of Haverstraw. Here there is a masonry dam across the stream storing about four million gallons. This water is pumped directly into the mains, the surplus being stored in two uncovered earthen reservoirs of 750,000 and 280,000 gallons capacity on a hill one-half mile north of the pumping station. The pumping equipment consists of two pumps, one operated by water power, the other by steam. The first is a 10½ x 18-inch Knowles turbine pump, having a 12-inch suction, a 10-inch deliverance, and a capacity rated at a million gallons per day. The other is a Worthington 12 x 20 by 12 x 10-inch pump, with a capacity rated at one and one-half million gallons per day.

Cedar Pond creek has a drainage area above the Stony Point dam of about nineteen square miles. The main stream has its source in Cedar pond in the Goshen mountains, Orange county, and flows in a southeasterly direction for a distance of eight miles to the Hudson river. It has a number of tributaries, the largest of which are Stillwater brook and Timp brook flowing into it from the north. The topography is very rugged, and the watershed is for the most part wild.

An inspection of this watershed was made June 29, 1908, by Mr. C. F. Breitzke, assistant engineer. With the exception of a section within a radius of two miles of the intake and along Timp brook, he found the Cedar Pond creek watershed practically uninhabited. The section near the dam, however, has become quite thickly settled, and in a large number of instances privies were found close to the stream. In one case a hog pen was directly over a stream.

Samples of the water were taken for chemical and bacteriological analysis at the time of the inspection from Cedar Pond creek at the dam near the pumping station. The results of this analysis together with those of other samples of this supply collected from time to time during the past year are given in the table on page 374 and clearly indicate a water of questionable purity. The analysis of the Thiells source of supply, however, indicated a water of good sanitary quality.

The pollution of Stony Brook supply can in most cases be removed and controlled by setting back the privies and certain hog pens from the stream. In a few instances satisfactory changes will be rather difficult to make. It appears, however, that practically all of this pollution can be avoided by moving the intake two and one-half miles up stream from its present location, to a point just below the junction of Stillwater Brook with Cedar Pond creek. This improvement would, at the same time, give a gravity supply and dispense, not only with cost of removing the pollution, but also with the high maintenance cost due to need of patroling the watershed and pumping the supply.

In conclusion, therefore, I recommend that the attention of the Haverstraw Water Supply Company be called to the insanitary conditions existing above their intake on Cedar Pond creek and that they be advised that:

1. Water of satisfactory sanitary quality can be secured from the Thiell's source of supply, provided that frequent and thorough inspections of this watershed are made.

2. The quality of the water from Cedar Pond creek under existing conditions is open to question.

3. The pollution of the supply undoubtedly comes from the settled area, largely within a two mile radius of the intake.

4. A thorough inspection of the entire watershed of Cedar Pond creek above the intake should be made.

5. Steps should be taken to improve the quality of the supply either by removing all sources of pollution above the intake and

taking steps to prevent their reoccurrence, or by avoiding this pollution by moving the intake upstream beyond the settled area.

6. In case they experience any difficulties in removing sources of pollution from their watershed, they should consider the question of application to this Department for the enactment of rules and regulations for the protection of their water supply.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

MARGARETVILLE

ALBANY, N. Y., *August* 7, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report of an investigation of the public water supply of the village of Margaretville.

Margaretville is an incorporated village in the southeastern part of Delaware county, seventeen miles southeast of Delhi, situated on the north side of the east branch of the Delaware river. It is a station on the Delaware & Eastern railroad and is about two miles from Arkville on the Ulster & Delaware railroad.

Margaretville has a population of about 700, about three-fourths of whom are directly connected with the public water works. The water supply is furnished by the Margaretville Water Company, of which M. A. Albers is secretary and also superintendent. The water works were installed in 1885 and consist of an impounding reservoir and about 3 miles of pipe ranging from 4 inches to 5 inches in diameter. There are about 130 service taps, none of which are metered. The average daily consumption is estimated at about 50,000 gallons. The water is furnished by gravity under a pressure varying from 78 to 120 pounds per square inch.

The water supply is obtained from Scott brook at a point about a mile north of the village. The impounding reservoir has a masonry dam and is uncovered. Originally it was much larger than it is now, but it has been filled in with drift deposited by the stream. At present the water surface covers about 2,500 square feet with an average depth of 5 feet, giving a storage capacity of about 90,000 gallons. At the time of the inspection owing to the lack of rainfall, this reservoir was empty.

Scott Brook has its source about three miles north of the village. Above the reservoir it has five tributaries with a total drainage area of about one and five-tenths square miles. Practically all of this area has been stripped of its woodland and most of the land is used for agricultural purposes. The topography is a moderately gentle rolling country and the underlying rock is sandstone.

An inspection of this watershed was made on July 14, 1908, by Mr. C. F. Breitzke, assistant engineer. There were seven houses on the watershed, having an aggregate population of about thirty-five. With the exception of three places the houses were located at a safe distance from the stream. One of these houses, however, located just above the reservoir, has its storm water, wash and drainage diverted to a point below the reservoir dam. At Robert Scott's place located about three-eighths of a mile above the reservoir a privy was found close to the stream. At Nelson Sanford's place about three-fourths of a mile above the reservoir, a privy was about fifteen feet from the stream. In addition to these privies there was ample opportunity for minor pollution from barnyards.

Samples of the water were taken at the time of the inspection and sent to the State Hygienic Laboratory for chemical and bacteriological analysis. The results of this analysis are given in parts per million in the table on page 374.

Owing to the lack of rainfall for several months prior to the inspection, the flow in this stream at the time of the inspection was entirely ground water. When free from pollution this water should have a normal chlorine content of 0.5 as compared with 1.10 in the above analysis and should show practically no nitrogenous organic matter and be entirely free from bacteria of the B. Coli type. The above analysis gives positive tests in all cases for bacilli of the B. Coli type and the whole analysis indicates beyond a doubt pollution of the water supply.

In conclusion, therefore, I recommend that the insanitary conditions on their watershed be brought to the attention of the Margaretville Water Company, and that they be advised that:

1. A thorough inspection of the watershed of Scott brook and its tributaries should be made and steps taken to remove all existing sources of pollution of their supply and to guard against their reoccurrence in the future.

2. In case they experience any difficulty in removing the sources of pollution on their watershed, they should consider the question of application to this Department for the enactment of rules and regulations for the protection of their water supply.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

PORT JERVIS

ALBANY, N. Y., *October* 21, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— In accordance with your directions and at the request of the city board of health of Port Jervis, made by telephone on October 19, 1909, to investigate the cause of certain disagreeable odors and tastes in their water supply and incidentally to advise them as to the safety of the supply and as to steps to be taken by them in removing the present objectionable features of this supply, I beg to submit the following brief report.

Mr. C. F. Breitzke, assistant engineer, was detailed to make an inspection of the reservoir and watershed from which the water supply of the city of Port Jervis is taken, with a view of determining the cause of the trouble complained of. On October 20, 1909, in company with Dr. Bernard J. Leahy and Mr. Merritt C. Speidel of the city board of health, he examined the water in various sections of the city and, in company with these gentlemen and Dr. W. L. Cuddeback, president of the Port Jervis water Works Company, he made an inspection of the watershed from which the regular supply is obtained and visited all the reservoirs and the pumping station near the northeast boundary of the city on the Neversink river from which a supplementary supply is being taken.

It appears that the regular supply is taken from a number of small streams supplying three reservoirs north of the city. A description of these reservoirs, together with the main impounding reservoir and the distribution system, is given in Prof. Ogden's report on the sanitary condition of the city of Port Jervis, copies of which were transmitted to the local authorities in June, 1909, and may therefore be omitted here.

From the inspections of the watershed of the main source of supply it appears that with the exception of certain insanitary conditions noted below, the watershed is largely an uncultivated, wild and wooded area and should yield a supply of pure and wholesome water. The places at which insanitary conditions were found were as follows:

1. *O'Gorman property*, Peter Conkling, tenant, located near northwest corner of reservoir No. 1. Here there were found an overflowing privy vault on a slope and about 120 feet from small stream flowing into reservoir, wash water, house slops, etc., 40 feet from stream a dumping place for refuse at the edge of stream and evidences of cattle wallowing in stream. These conditions are all a violation of the rules and regulations enacted by this Department on August 19, 1897, for the protection of the water supply of the Port Jervis Water Works Company, and are a menace to the purity of the supply.

2. *O'Gorman property*, Sam Hasbrouck, tenant. located immediately south of house referred to in No. 1. Privy located in and hen-yard at edge of a shallow gully, which in wet weather serves as a drainage course flowing across highway and thence into reservoir No. 1.

3. *Edward Smith place* is located on steep bank and about 800 feet west of reservoir, and has privy and point of discharge of wash water and house slops on the course of drainage of an intermittent stream flowing into reservoir No. 1.

4. *Caretaker's House, Reservoir No. 3.* Manure pile found in rear of stable about 200 feet from reservoir No. 3, on a slope

and in path of drainage. Privy located about 100 feet from high-water mark of reservoir and has loose vault. Tight vault should be provided for a privy, and a concrete pit should be provided to receive the manure from the stable.

For the past month the water furnished the residents of Port Jervis has been unpalatable, the people being obliged to use spring water and in many cases water from wells, the character of which is questionable. The water in reservoir No. 1 has been somewhat turbid and filled with algae growths and has had a fishy odor. As a result of these objectionable features water has for over three weeks been pumped from the Neversink river, which supply is pumped directly into the mains without storage or filtration.

It is evident, then, that the case presents two aspects, one regarding the sanitary quality of the regular supply, the other regarding the quality of the supplementary supply from the Neversink river. From the fact that the city is now being supplied with water from the Neversink river, which may be of questionable quality, this matter is a more important feature in the situation than the treatment of the supply from the reservoirs. For convenience, however,, the conditions surrounding the regular supply will be considered first.

The inspection of the watershed and the reservoirs showed that the troubles complained of are due to conditions in the lower reservoir since it was found that water was not being drawn from the upper reservoirs and since it was found from examination that the water in the upper reservoirs was not only free from contamination, but also from objectionable growths. The lower reservoir, on the contrary, was found subject to some pollution from objectionable and possibly dangerous sources, such as for instance the almost direct contamination from the O'Gorman property referred to above.

In this reservoir there were found growths of such quantity and quality as would seriously affect the esthetic quality of the water. These growths are in all probability due to an accumulation of organic matter in the reservoir and are without doubt nurtured by the pollution received from the O'Gorman estate.

Although a sample of water taken from reservoir No. 1 has been examined miscroscopically, it has not been possible to determine definitely to what specific organism or organisms the odors and tastes complained of are due. A large number of species of algae and protozoa of various kinds were found, also some species belonging to a higher class of microscopic organisms indicating that microscopical life is prolific, and that the odors and tastes are due unmistakably to them.

In regard to measures which should be taken to remove these objectionable growths, it would seem that the first thing to do is to thoroughly clean the lower reservoir and distributing system. If this reservoir is cleaned and organic pollution removed, I believe that the water may be kept comparatively free from microscopical growths or at least controllable by occasional application of copper sulphate made under the supervision of an expert in this field.

The second step which should be taken is to remove the possibility and prevent entrance into the reservoir of all organic pollution and contamination from houses and neighboring fields, particularly that from the O'Gorman property. It is important in this connection to see that the rules and regulations enacted by this Department in 1897 for the protection of the water furnished the residents of Port Jervis by the Port Jervis Water Works Company are rigidly enforced and that the procedure provided for under the Public Health Law be strictly followed.

Considering now the quality of the water being supplied from the Neversink river, it is my opinion that until the water is shown by chemical and bacteriological analyses to be safe, that water from this source, considering the possible pollution on the watershed, cannot be considered free from danger. This stream, while apparently clear and wholesome, drains an area upon which there are a considerable rural population and a number of small villages or hamlets, which while they may not have public sewer systems, may nevertheless contribute pollution. Another great source of danger is that of pollution from railroads which parallel the lower part of the Neversink river, and two of its longer tributaries. Thus it appears that while no time or opportunity has been available to inspect this watershed, the amount of direct and indirect pollution may be sufficient to produce a menace to the health of those using this supply unfiltered.

The fact that no water-borne disease has appeared so far among consumers of this supply is no argument as to the safety of this supply, since sufficient time has not elapsed to indicate any such comparative safety and since any immunity that may be temporarily experienced against dangers of this supply may be followed at any time in the future by an epidemic, should any of the pollution which now exists come from an infected source. In fact, the city board of health and the water company should be especially on their guard to detect cases of typhoid fever in any of the hamlets and small villages on the watershed of the Neversink river; to prevent as far as possible the infection of this supply; and to warn the public to boil the water until such time as the pollution can be controlled or until a safe supply can be secured.

It is evident, then, that immediate steps should be taken by the city authorities and the water company to improve the regular supply in such a manner as will remove not only all danger from contamination, but also the objectionable taste and odors. It is equally if not more important that steps be taken to ensure the safety at all times of the supply obtained from the Neversink river. This may be accomplished by efficient filtration and by adequate measures to curtail pollution on the watershed.

In regard to immediate measures other than boiling the water which might be taken to provide temporary safety of the supply from the Neversink river in case chemical and bacteriological samples to be taken and an inspection of the watershed show that contamination of the supply is taking place, until more permanent improvement is made by filtration, it may be said that it is possible to temporarily sterilize this supply by the application of hypo-chloride of lime in such small amounts as will kill disease germs and not affect to any appreciable degree the chemical quality or wholesomeness of the supply.

This method of sterilization has been recently successfully practised by Jersey City, Poughkeepsie and other places, and whereas at this time I do not wish to place myself in a position of recommending this method as a permanent one, I believe it is worth careful consideration and immediate investigation by some competent expert in water purification in behalf of the Port Jervis

Water Company. In any event it should not be undertaken by anyone except a competent expert. This method may involve some slight re-arrangement of the present intake system and possibly some temporary construction, and these matters should be included in a study made by an expert engineer.

In view of the possible danger to which the supply from the Neversink river is open and the insufficiency and unwholesomeness of the regular water supply under present conditions, I beg to recommend that:

1. Immediate steps be taken to improve the regular supply in accordance with the suggestions made above and to make these improvements as soon as it is possible.

2. Samples for chemical and bacteriological analysis be taken from the Neversink river to determine its sanitary quality. This analysis should be supplemented by an inspection of the watershed of that river and its tributaries.

3. If it is decided to continue the use of the Neversink river as a source of supply steps should be taken at once looking to a permanent improvement of this supply by filtration, and if after taking the measures recommended above under No. 2, the water is found subject to pollution and contamination, immediate temporary measures should be considered to protect this supply by sterilization until a permanent improvement by filtration is made.

4. Until the above measures have been carried out to secure a safe supply, an unusual oversight should be exerted by the city board of health and the Port Jervis Water Works Company to detect any outbreak or occurrence of water-borne diseases on either the watershed or in the municipality and, if such occurs, to warn the public to boil the water.

I should further recommend that copies of this report be transmitted to the city board of health and to the Port Jervis Water Works Company, and that they be advised that, owing to the many factors associated with their water supply which affect its sanitary and esthetic qualities, it would be the part of wisdom and economy for them to employ an expert water works engineer to make a study of improvements along the lines suggested above and to advise them more fully and in more detail as to the best and most economical means for carrying out these and possibly other improvements to their supply.

Finally, I beg to state that whereas I believe there is no provocation for immediate alarm over the present situation concerning their supplies, I am of the opinion that the recommendations made above should be carried out without delay.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *November* 16, 1909.

MR. MERRITT C. SPEIDEL, *Health Commissioner, Port Jervis, N. Y.:*

DEAR SIR:— I am sending you herewith records of analysis of samples taken by your health officer, Dr. F. E. Gessner, from reservoir No. 1 from the Neversink river at the pumping station, and from a tap in the city.*

These analyses show that although there is a difference in the chemical and biological qualities of the waters from the reservoir and Neversink river, bacteria of the B. Coli type were found present in both supplies in samples of the water as small as 1 c.c., substantiating the observations made in regard to pollution of the supply at the time of the inspection and the general conditions stated in the report recently transmitted to you.

Owing to the variable composition of the two waters, it is difficult to compare them in the light of analytical data. The water in the reservoir is high in organic pollution due for the most part to algae growths and is objectionable in its esthetic quality. The water from the Neversink river on the other hand, is comparatively free from objectionable tastes and odors, but shows slightly more pollution. In regard to evidence of pollution and contamination, it is clear, judging from the B. Coli results, that both receive pollution derived undoubtedly from animal origin.

It is essential in comparing these two sources of supply to differentiate as to the nature of the sources of this pollution. With the reservoir, it was shown by the inspection and report that while the pollution is derived in a measure from an accumulation of organic matter previously drained from manured fields into the reservoir as well as to organic matter now entering the reservoir from surface wash containing filth and some wastes of human origin, it comes nevertheless from sources which can be largely, if not wholly, controlled.

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* For records of analyses see table on p. 374.

With the Neversink river, however, it was pointed out that, while a considerable amount may result from other sources than from human origin, judged from the conditions on the watershed, a relatively larger amount of it must be directly from human sources which it is difficult, if not impracticable, to control.

The question of lack of control and possible infection of the Neversink river supply is an important one since, as pointed out in the report, the reservoir can be cleaned and all dangerous and objectionable sources of pollution on its watershed removed, whereas on the watershed of the Neversink river, the pollution from railroads, from sewers and drains, and other similar sources can never be subject to perfect control and consequently a menace to the purity of this supply will always exist.

While the analysis of the Neversink river water at the time the sample was taken did not show it to be subject to gross pollution, the analysis taken in conjunction with known conditions on the watershed leaves this source of supply one which cannot be considered a safe one for a permanent supply without a purification plant to guard against infection that may occur at any time, whereas with the reservoir the watershed has very little contamination, which, as pointed out, can be removed, and however objectionable the water may be at the present time from an esthetic standpoint, this supply can be made safe and wholesome.

I would, therefore, again emphasize the importance of the factors discussed in the report of our engineer previously transmitted to you, and I trust that in the light of the confirmatory evidence furnished by these analyses and the discussion above given in reference to them, the recommendations contained in said report will again be carefully considered and acted upon.

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

SAG HARBOR

ALBANY, N. Y., *October* 26, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report of an investigation of the public water supply of the village of Sag Harbor:

Sag Harbor is an incorporated village in Suffolk county, located at the head of Gardiners bay at the center of the eastern end of Long Island. It is the terminal of a branch of the Montauk division of the Long Island Railroad, running from Bridgehampton to Sag Harbor. It also has connections with Greenport, Montauk, Block Island and New London via boats of the Montauk Steamship Company.

Sag Harbor has a population of about 3,500, about three-fourths of whom are directly connected with the public water works. The water is furnished by the Sag Harbor Water Company of which Mr. Henry F. Cook is president, and Mr. C. R. Sleight is superintendent. The water works consist of an intake box, a pump well or settling basin, a pumping station, a standpipe, and about eight miles of mains ranging from four inches to ten inches in diameter. It is estimated that there are about 350 service taps, of which none are metered. The average daily consumption is estimated at about 465,000 gallons, about half of which is used by Fahy's Watch Factory. The water is furnished under an average pressure of forty-five pounds per square inch.

The original water works were installed in 1888. At that time four wells were sunk near the pumping station to a depth of forty feet, and were in service for about a year when the water became too highly colored for water works use. The wells were then driven to a depth of 100 feet. After a while the water again took on a deep reddish brown color and they were abandoned. A large collecting well twenty feet in diameter and fifteen feet deep was then constructed about 900 feet south of the pumping station at edge of Round pond, and four forty-nine feet wells were driven near it with same result. The driven well system was then abandoned and water was piped from Ligonee brook into the large well which serves as settling basin and pump well.

The intake on Ligonee brook is located at a point near the southwest corner of the village and consists of a box 10 feet long, 3 feet wide and 4 feet deep, made of 1½-inch plank and provided with screens, built in the ground at the edge of the stream and with its long axis at right angles to it. Water enters from this into a 12-inch pipe running in a northeasterly direction for about 1,000 feet, and discharging into the collecting well referred to above. This is made of brick plastered with cement and is covered with a wooden conical shaped roof. The pumping station is a rectangular brick building about 30 feet by 20 feet in plan, provided with two boilers and two Worthington steam pumps pumping against a pressure of fifty pounds per square inch, one being a 10-inch and 16-inch by 10½-inch by 10-inch duplex pump with a capacity rated at 750,000 gallons a day, the other a 12-inch by 7-inch by 10-inch pump with a daily capacity of 500,000 gallons. At the time of the inspection the large pump was being operated for fifteen hours a day. The standpipe is 20 feet in diameter and 100 feet high, and has capacity of 230,000 gallons.

Ligonee brook is a small stream forming the western boundary of the village of Sag Harbor, and flows from Long pond in a northerly direction into Noyack bay. Above the Sag Harbor Water Company's intake it has a drainage area of about one and one-half square miles. The region is gentle rolling country, in general almost flat in its character, consisting largely of sand dunes thrown up by Atlantic storms and modified by the eroding and carrying power of strong winds acting upon the dry sands the dunes taking on curious shapes and modification of form and position forming valleys, basins and spurs. These have become covered with a good growth of dune grass and with oak shrubs and trees.

An inspection of this watershed was made on September 18, 1909, by Mr. C. F. Breitzke, assistant engineer. The water in Long pond was very low and covered but a small area, the rest of the area which had been flooded being swampy. With the exception of an Italian settlement at the brickyards of the Long Island and Fishers Island Brick Company, located about one-half mile southwest of Long pond, and where there are some thirty Italian laborers employed, no houses or resident population were found on the watershed. It appears that while there is no direct pollution from this settlement, the Italians wash and bathe at the upper end of Long pond on Sundays. The Sag Harbor branch division of the Long Island Railroad traverses the watershed for a distance of a mile, passing at one point within a few feet of Long pond.

No epidemics of typhoid fever have ever occurred in Sag Harbor village, the health officer, Dr. C. E. Wells, stating that only four or five cases have occurred in the last fifteen years, and these have been traced to other causes than water supply. The water at the time of the inspection, however, had an unpleasant musty odor, and it appears that there were a number of diarrhoeal complaints.

Samples of the water were taken on September 23, 1909, from a tap in his residence by Dr. C. E. Wells, health officer, and were sent to the State Hygienic Laboratory for chemical and bacteriological analysis. The results of this analysis in parts per million are given in the table on page 374.

The analysis seems to bear out the observation that there is some pollution on the watershed, and for this reason this source of supply cannot be considered safe from a sanitary standpoint. If, however, the pollution by the Italian laborers and the railroad is prevented, the supply may in all probability be considered safe.

The analysis shows clearly that there is an abnormal presence of an unusual amount of organic matter of vegetable origin. The chemical analysis in conjunction with the high number of bacteria indicates that the water is full of organic matter in a state of decomposition, thus accounting for the high color and unpleasant musty taste and odor made the basis of complaint.

In conclusion, therefore, I recommend that the attention of the Sag Harbor Water Company be called to the insanitary conditions associated with their source of water supply, and that they be advised that:

1. Steps should be taken to prevent the use of Long pond or any other pond on the same watershed by Italian laborers from the brick yard for washing or bathing.

2. Arrangements should be made with the Long Island Railroad Company to lock the toilets on all trains passing over their tracks between Sag Harbor and Bridgehampton.

3. There seems to be no reasonable way to improve the esthetic qualities of the water, such as the unpleasant musty taste and odor in the present supply obtained from Long pond and Ligonee brook outside of filtration and aeration or in securing some other source of supply.

4. In case they experience any difficulty in preventing the pollution of the water supply by Italian laborers and by pollution from the railroad or otherwise, they should consider the question of application to this Department for the enactment of rules and regulations for the protection of their water supply.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

SAUGERTIES

ALBANY, N. Y., *December* 31, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of an investigation of the public water supply of the village of Saugerties:

Saugerties is an incorporated village in the northeastern part of Ulster county, about eleven miles north of Kingston at the junction of Esopus creek with the Hudson river. The West Shore Railroad passes through the western outskirts of the village and railroad connections may also be made with the main branch of the New York Central and Hudson River Railroad via ferry at Tivoli.

It has a population at present of about 3900, seven-eighths of whom are directly supplied from the public works. The water works are owned by the village and are under the control of a board of water commissioners of which Mr. George W. Washburn is president, and Mr. S. Yates Knight is superintendent.

The original water works were installed in 1886–87 by the Saugerties Water Company. On May 9, 1888, rules and regulations were enacted by this Department for the protection of this supply. In 1896 the plant was bought by the village and a new dam constructed for the reservoir. In 1904 the intake works were improved. The water works now consist in addition to the reservoir and intake works of about sixteen miles of mains ranging from four to sixteen inches in diameter and 730 service taps about 11 per cent of which are metered. The average daily consumption is estimated at 450,000 gallons, of which about 50,000 gallons are used for commercial purposes and 10,000 for public purposes. The water is distributed by gravity under an average pressure of eighty pounds per square inch.

The water supply is obtained from Plattekill creek at a point about five miles northwest of the village near a settlement known as Blue Mountain about three miles from the mountains. A stone masonry dam at this point is about thirty feet long and about ten feet high. The reservoir is uncovered, has an area of about three and one-half acres and an average depth of six feet, storing about 6,000,000 gallons or about thirteen days' supply. At all times during the past summer water has been flowing over the dam. The intake works consist of two masonry chambers located at the lower end of the reservoir just above the dam. A strainer consisting of a gravel bed about three feet wide enclosed between two wire screens, extends across each chamber.

Plattekill creek is formed largely by a number of streams having their rise in the Catskill Mountains, its watershed being adjacent to that of Schoharie creek on the west and that of Kaaterskill creek on the north. It has a watershed about seventeen square miles in area, about one-half of which is in the mountains and the remainder is a comparatively flat valley at their base.

The main stream has its source on top of the mountains at Platt Clove close to the Schoharie creek watershed line and has a number of tributary branches from High Peak, Indian Head Mountain, Plattekill Mountain, and the mountain east of Platt Clove postoffice. It flows for about three and one-half miles in a southeasterly direction through Plattekill Clove, a deep gully having for a distance of nearly two miles a fall of over 600 feet per mile, through the hamlet of West Saugerties and thence in a northeasterly direction in a winding course for about two and one-half miles to a point of junction with a stream from the north, which in this report will be referred to as the Saxton stream, about one and one-half miles.

At the request of the local board of health, an inspection of this watershed was made on December 18, 1909, by Mr. C. F. Breitzke, assistant engineer, accompanied by Dr. J. H. DeWitt, health officer, and Mr. Cordes of the town board of health. No attempt was made to inspect the entire watershed, but in the time available it was possible to cover the hamlet of West Saugerties and the major portion of the drainage area at the base of the mountains. The settlement of Platto Clove postoffice located in a valley on top of the mountain was not inspected. There are, however, some twenty-five to thirty farmhouses and summer resorts here, many of which according to the United States Geological Survey topographical map are located in close proximity to the streams. At West Saugerties at the immediate base of the mountain, there are some thirty houses inhabited for the most part by quarrymen and their families. These houses are located along the sides of a single highway running through the hamlet and are for the most part close to the stream. The inspection revealed that some sixteen cases, dangerous violations of the rules enacted by this Department for the protection of the Saugerties water supply existed. The lower portion of the watershed is farming country and contains in addition to the settlement of West Saugerties some eighty to ninety farmhouses and small summer resorts. Many of these buildings were found situated close to the streams and to be violations of the rules enacted for the protection of the water supply. Three of these places were in close proximity to the reservoir.

It appears that there are some 140 to 150 farmhouses and summer resorts on the watershed having an aggregate population of 500 to 600 persons or about 35 per square mile if the whole area of the watershed is considered. Taking into account, however, the fact that the greater portion of this population is concentrated in about half of the area, the population on the watershed is from fifty to fifty-five per square mile.

The watershed is frequently patrolled by an inspector of the Saugerties board of water commissioners, but apparently more for the removal of dead animals and prevention of pollution of a temporary character than for the pollution by privies and the enforcement of the water rules. During the partial inspection of this watershed, some thirty-eight places were recorded, the conditions at which were a menace to the purity of the supply.

* * * * * * * * *

Inquiry was made of the health officer at the time of the inspection as to the prevalence of typhoid fever on the watershed and in the village of Saugerties, and our engineer was told that cases of typhoid fever frequently occur on the watershed, usually in the late summer and fall particularly at West Saugerties. Although no definite information was obtained with reference to these cases, it was alleged by the health officers that very careful precautions have been taken by the attending physicians to observe the necessary caution in the application of disinfectants and to prevent the spread of diseases or infection.

It was further alleged by the health officer that the village of Saugerties has had only isolated cases of typhoid fever. Although it was not definitely learned as to the exact number of these cases, and their seasonal distribution, the fact that they have been isolated and scattered would indicate that some at least may be traceable to the water supply.

The inspection made by our engineer necessarily covered only a portion of the watershed. A thorough inspection ought, therefore, to be made, in accordance with the rules enacted by this Department for the protection of this particular supply, of the entire watershed of Plattekill creek and its branches. Measures should then be taken to remove all existing sources of pollution and to guard against their recurrence in the future. The board of water commissioners will find that this work of removing pollution will be greatly facilitated if they will follow the procedure laid down in section 71 of chapter 45 of the Consolidated Laws (Public Health Law).

Samples of the water for sanitary analysis were taken at the time of the inspection from the main or West Saugerties branch of Plattekill creek just above its junction with the Saxton branch, from the Saxton branch just above this junction, from the reservoir just above the dam, and from a tap in the village, and were sent to the State Hygienic Laboratory. The results of the analysis of these samples, together with those of two other samples from Saugerties analyzed during the past year are given in the table on page 374.

A glance at the figures in this table shows that the chlorine is almost twice the normal for this region, that all analyses show the presence of nitrates, and that in spite of the fact that all samples were taken in cold weather when fecal organisms often fail to respond to tests, these organisms were found present in the majority of cases in samples as small as 1 c. c., and also in some of the one-tenth c. c. samples tested. These analyses confirm the results of the inspection of the watershed in that they indicate that contamination of the water supply is taking place. The fact that serious consequences have not followed the use of this supply has been due to good fortune, and the precautionary measures taken in the cases of typhoid fever which have occurred on the watershed referred to above. That such immunity could be relied upon is very doubtful and such an attitude would be a dangerous one, and may lead to serious consequences.

In considering means by which this supply can be best improved, there seem to be two features which from a practical standpoint it would be well to investigate. The first is the elimination of pollution by a more efficient patrol of the watershed made possible by the rules and regulations enacted by this Department for the protection of this supply. The other is the application of corrective measures such as purification of the water, thus insuring the safety of this supply from the indirect as well as the direct pollution which is bound to come from a large population on a watershed. Even if the latter is adopted it will be highly desirable to remove as much as possible direct pollution from streams tributary to the supply.

Considering the large population and the large number of cases of pollution on the watershed, and owing to the fact that the Catskill mountains are year by year developing into a popular summer resort, it would be impracticable to prevent an increasing amount of indirect pollution even if the direct pollution is largely eliminated. The second course, that of purifying the water would, therefore, prove the more effective barrier against the dangers which now menace the supply.

I should, therefore, recommend that the Saugerties board of water commissioners be advised to take immediate steps to secure the necessary and adequate protection.

1. By such action as is provided by the rules and regulations which were enacted by this Department for the protection of this supply, and as will remove all existing sources of pollution.
2. By further protecting the supply by the installation of a modern filtration plant or some other suitable method of purification.

A glance at conditions below the reservoir would indicate a suitable location of filters which can be operated economically by gravity. This is a matter, however, in which the board of water commissioners should secure the services of a competent expert to make a careful study of the problems, and to advise them definitely as to the best means of providing a safe and wholesome supply of water.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

SIDNEY

ALBANY, N. Y., *September* 13, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of an investigation of the public water supply of the village of Sidney:

Sidney is an incorporated village in the northwestern corner of Delaware county, situated on the Susquehanna river, about a mile above the mouth of the Unadilla river. It is about thirty miles northeast of Binghamton, and is a junction station of the New York, Ontario and Western and the Delaware & Hudson Railroads.

Sidney has a population of about 2,700, 80 per cent. of whom are directly connected with the public water works. The water works are owned by the Sidney Water Works Company, and at the present time consist of a large impounding reservoir with a mechanical-gravity filter on Peckham brook, four small impounding and storage reservoirs with mechanical filter on Collar brook, and about sixteen miles of pipe varying from 4-inch to 10-inch in diameter. There are about 410 service taps, none of which are metered. The average daily consumption is not known, water being used in addition to the domestic consumption by the N. Y., O. & W. and D. & H. Railroads, by a silk mill, by a sash and blind factory, by a carriage works, by a novelty works, and by the Sidney Mill and Lumber Company. The water is furnished by gravity under an average pressure of about eighty-five pounds per square inch, from the Collar brook supply, and eighty pounds per square inch from the Peckham brook supply. Mr. Henry W. Clark, Sidney, N. Y., is president of the water company, and Mr. Wm. E. Barker is superintendent of water works.

The water supply of Sidney has been taken from three sources, two of which, Collar and Peckham brooks are being used at the present time. The original works were installed on Collar brook in 1889–90, and are still in use furnishing about one-third of the supply. In 1901 a new supply was developed on Guilford creek, and continued in use until October, 1908, when they were discarded on account of their low pressure in favor of a supply from the Peckham brook reservoir, which had just been completed.

Collar Brook System. This supply is obtained from Collar brook (also known as Pine Hill creek), at a point about two miles southeast of the village and is about one-third of the entire supply. The water works consist of four impounding and storage reservoirs, a crude sand and gravel preliminary scrubbing filter, and a "flumehouse" with controller for open gravity mechanical filter in the bottom of the lowest reservoir. The reservoirs are located on the same stream in a rocky ravine, one immediately above the other, and for convenience of reference in this report will be designated as Nos. 1, 2, 3 and 4, respectively, beginning with the upper reservoir.

These reservoirs all are uncovered. The upper three reservoirs have each an area of water surface of about 1.5 acres. Reservoirs Nos. 1 and 2 have earthen dams with masonry core-walls, 32 feet and 28 feet high respectively. Reservoir No. 3 has a masonry dam about 75 feet long and 24 feet, backing up the water in a small pond 160 feet long by 5 to 10 feet deep. Reservoir No. 4 has an earth dam with masonry core wall riprapped 2 to 1 slopes and is 60 feet long, 57 feet wide and 12 feet deep. These four reservoirs have a combined storage capacity of about 11,000,000 gallons.

These works originally consisted of Reservoirs Nos. 1, 2, and 3, Nos. 1 and 2 serving as impounding and storage reservoirs and No. 3 as a distributing reservoir, and was provided with a so-called "natural" filter above the intake and a "flume house" containing a clear well. The flume-house is 23 feet x 16 feet and is located midway across the dam, extending into the reservoir. Two short lengths of 10-inch pipe, provided with valves and screens project through the walls of the flume-house. Cobble stones were laid next to the screens, then 3 feet of gravel, 3 feet of course sand and 18 inches of fine sand respectively on a 3 to 1 slope. Through this "natural filter" constructed after plans of W. B. Rider of South Norwalk, Conn., in 1889, the water passed into the flume-house and thence into the mains leading to the village.

The development of a serious and unlocateable leak through the rock in the bed of the stream led to the construction, in 1891, of Reservoir No. 4, provided with a gravity mechanical filter designed by Messrs. Clark and Baker.

Reservoir No. 4 lies below the gate house and about 20 feet below the bottom of the flume house. The reservoir is fed by water passing from the flume house well to the gate house well and thence through a 6″ pipe to a small aerating fountain. The filters are two rectangular concrete tanks 12 x 24 feet, 11 feet deep, built in the bottom of Reservoir No. 4 and open at the top. At the bottom of each tank and transverse across the center there is a 6″ main collector connecting directly with the village main. At right angles to main collector are 2″ laterals provided with slotted strainers furnished by the Pittsburgh Filter Manufacturing Company. The straining system is covered with 1 foot of gravel and about 3 feet of sand.

The filters are washed about once a week by lowering the water in the reservoir below the level of the walls of the filter tanks and allowing water from the "flume house" well to enter the under drains, causing a reversed flow through the bed until the wash water runs clear.

Collar brook has its source about 3.5 miles southeast of Sidney and flows in a deep and rocky ravine in a northwesterly direction into the Susquehanna river. Above Reservoir No. 4 the stream is about 1.5 miles long and has a drainage area of about one square mile. The banks of the ravine are well wooded but the rest of the watershed is largely pasture land. The soil is somewhat clayey and sandy and the underlying rock is a sandstone.

Guilford Creek System.— This plant is located about three miles north of Sidney and consists of two vertical pressure mechanical filters operated under a head of about forty pounds obtained from an impounding reservoir on Guilford creek, having a surface area of about two acres and a depth of three to five feet. The filters were designed and installed by the Pittsburgh Filter Manufacturing Company of Pittsburgh, Pa., and are housed in an underground concrete vault. Each unit consists of a cylindrical iron tank with a dome top, six feet in diameter and seven feet high. Coagulant is not regularly employed and most of the time raw water passes through the sand bed without preliminary treatment. Guilford creek is a stream with a rapid run off and with little woodland, the catchment area being mostly pasture land. One farm and creamery are sources of pollution above the intake.

This supply has recently been abandoned on account of its low pressure in favor of the Peckham brook supply, put in service in October, 1908. It is, however, still being used to supply the residents of the hamlet of East Guilford.

Peckham Brook Supply.— This supply is impounded from Peckham brook at a point two and one-half miles northwest of the village. The works consist of a large impounding reservoir and two gravity mechanical filters designed by Messrs. Clark and Barker. The reservoir is about 1,600 feet long and has an average width of about 490 feet, giving an area of water surface of about eighteen acres. It is 32 feet deep at the dam and has an average depth of 11 feet. It has a storage capacity of 63½ million gallons. The water is impounded by an earthern dam with a masonry core wall and the side slopes of the reservoir are riprapped, the site of the reservoir having been excavated, with the exception of the extreme upper end, to a depth of 4 feet, near the shore line.

The dam is about 200 feet long and about 35 feet high. Midway across it and extending down to the bed of the stream a rubble masonry filter chamber covered over with a stone arch has been built. This chamber is divided into three compartments, two filter beds and a pipe gallery. The filter beds are each about 12 feet square and the pipe gallery, located midway between them, is about 6 feet wide. At the bottom of each bed is a system of 3-inch collecting pipes fitted with dotted strainers furnished by the Greer Filter Company. Above these are a foot of gravel and 3 feet of sand. The water stands over the sand to a depth of about 30 feet. Coagulant is added to the water in a crude and unscientific manner, the attendant twice a week grinding a handful of alum in a mortar and sprinkling it over the surface of the water on the filters. The filters are washed about once a week, the process consisting of lowering the water in one of the filters and fitted with dotted strainers furnished by the Greer Filter Company. Above these there are a foot of gravel and 3 feet of sand. The water stands over the sand to a depth of about 30 feet.

The intake pipe projects thirteen feet into the reservoir. Its mouth is about five feet from the bottom and opens into a loose rubble masonry chamber 2 feet x 3 feet in plan and into the upstream and side walls of which there lead fifteen 3-inch vitrified pipes which serve as collectors of the water from various points in a bank in front of the dam, consisting respectively, beginning at the bottom, of layers of coarse cobble stones, fine cobble stones, coarse gravel, fine gravel, coarse sand, and fine sand laid adjacent to the dam and on a slope of about forty-five degrees.

Peckham brook flows in a southeasterly direction into the Unadilla river through rather steep rolling country with deep and wide valleys. The profile of the stream itself is gentle; above the reservoir there is a drainage area of about three square miles. About a mile and a half above the reservoir Peckham brook divides into two branches, one from the northwest and the other from the north, each branch being about two miles long. The soil is clayey and sandy. The underlying rock is of sandstone foundation. About one-half of the watershed is wooded, the rest being stripped timber and pasture land. The northwest branch of Peckham brook has its source in a marshy area. The ground is full of springs. At the head of the reservoir the ground is also somewhat marshy.

Sanitary Quality of Water Supply.— An inspection of the watersheds of Peckham and Collar brooks was made on August 13, 1909, by Mr. C. F. Breitzke, assistant engineer. On the Peckham brook watershed there are thirteen dwellings with other buildings, nine being located on the watershed of the northwest branch and four on the north branch. In general these houses are well back from the stream. Three possible cases of pollution were found, two on the northwest branch and one on the north branch, and are as follows:

1. *Loomis place,* two miles above reservoir. House at present empty, but located on side hill with stable and privy in springy ground about twenty-five feet from a small stream and 150 feet from main stream.

2. On northwest branch at corner Bainbridge — Guilford Rd., and road leading to Sidney at point about three miles above reservoir, stable and barnyard at edge of stream.

3. *H. G. Albright* place on South Hill road from Sidney to Guilford, located on north branch of Peckham brook about two miles above reservoir. Stable located at edge of stream. Water company has diverted main portion of stream, but old channel is still there and in wet weather will carry pollution.

Peckham brook reservoir is entirely surrounded by forest land. With the exception of a small portion at the extreme upper end the side slopes have been riprapped and the water had a clean appearance. At the upper end the land is somewhat marshy and the stripping of the site was not completed. There was also evidence of an accumulation of humus matter in this portion of the reservoir at the point of entrance of Peckham brook.

On the Collar brook watershed a highway runs along each side of the stream and crosses it at its upper end, tho houses being located on the opposite side of the highways from the streams and consequently well removed. Five houses were found on this watershed, one of which is near the stream. This is located at the head of the stream at the corner of the road at the east side of the brook and the crossroad at its head. Owing to the shortness of time this house was not visited.

Outside of installing the filters referred to above, the water company has apparently taken no steps to protect the water supply from pollution and no systematic sanitary patrol of the watershed is maintained. To the health officer's knowledge no typhoid fever cases ever occurred on the watershed. There has been no epidemic of typhoid fever, there being a case only occasionally, and these cases have usually been attributed to other causes than water supply.

At the time of the inspection the flow in the streams was exceedingly low, there having been no rainfall for many weeks. The water from the Peckham brook reservoir was brown in color and had a sweetish vegetable musty odor. It was also reported to have at times a "puckering" taste. The water from the Collar brook system was comparatively low in color and free from objectionable odors.

Samples of the water were taken at the time of the inspection from both the Peckham brook and Collar brook supplies and sent to the State Hygienic Laboratory for chemical and bacteriological analysis. The results of this analysis together with those of samples collected by representatives of the laboratory during 1908–1909 are given in the table on page 374.

These results show that with the exception of the winter months B. Coli have been found constantly present in quantities of water as small as 1/10 cubic centimeter and in the winter months they were usually present in 10 c.c. and 1 c.c. samples and in the 1/10 c.c. sample taken from Collar brook supply on January 13, 1909. The number of bacteria per c.c. in only three cases is down to a reasonable figure for a surface water and in only one case to what a filtered water should show. The chemical figures indicate by the oxygen consumed, nitrogen and chlorine values, that there is at times considerable pollution and substantiate the evidence revealed by the bacteriological examination and by the inspection of the watersheds.

The fact that the village has not suffered from water-borne diseases is due to the fact that the contamination has not come from an infective source. Should, however, any communicable disease occur on the watershed at points where pollution of the stream takes place, the village would be menaced by a possible outbreak of the disease.

Frequent complaints have been made in regard to the high color and unpleasant odor of the Peckham brook supply. These features, while not in themselves dangerous to the health, are nevertheless objectionable from an esthetic point of view and a public water supply to be wholesome and palatable should be free from features which render it unattractive as well as from contamination.

The high color and the unpleasant taste and odor in the water from the Peckham brook reservoir are due largely to an accumulation of organic matter at the bottom of the reservoir, such as leaves, etc., blown into it from neighboring trees, undergoing decay and partly to the fact that the upper end of the reservoir is swampy and contains stumps, vegetation and an accumulation of organic matters. Although no microscopical analysis of the water was made, the indications are that microscopic organisms play a very small, if any, part in the problem, although this cause is often associated with the others. The " puckering " taste which the water is stated to have at times may be due to the astringent vegetable extracts which give the water its high color, although since this " puckering " taste is reported only at times it may possibly be due to alum passing through the filter owing to uneven distribution inherent in the crude and unscientific way it is added to the water.

In conclusion, therefore, I recommend that the insanitary conditions on their watershed and the undesirable features associated with the supply as regards color and odor be called to the attention of the Sidney Water Works Company, and that they be advised that:

1. A thorough inspection of the watersheds of Peckham and Collar brooks should be made and steps taken to remove in addition to those noted above all other existing sources of pollution of their water supply and to guard against the recurrence.

2. In case they experience any difficulty in removing the sources of pollution on their watersheds, they should consider the question of application to this Department for the enactment of rules and regulations for the protection of their water supply.

3. Steps should be taken to improve the efficiency of the filters by providing adequate facilities for properly and scientifically applying the alum.

4. The matter of the removal of color and unpleasant tastes and odors is one which is involved considerably with the construction and operation of the impounding and filter systems.

5. At the earliest opportunity steps should be taken to improve the upper end of the reservoir with a view to removing the stumps and other debris of an organic nature which injure the quality of the water directly by their decay and will indirectly by harboring undesirable organisms. Some provision should also be made to intercept the organic matter washed into the reservoir at this point by Peckham brook.

6. Much of the color and unpleasant odor in the supply is due to the intake being near the bottom of the reservoir and consequently stagnant water being taken into the mains. It appears therefore that the quality of the water can be greatly improved by having an intake system that will take water at various depths.

7. Water having objectionable esthetic qualities due to growths and decomposing organic matter in the reservoir may often be improved by supplementary treatment such as filtration and aeration. Mechanical filters of good design and well operated are capable of removing color. Objectionable odors can be removed by double filtration or by aeration. Such an improvement would also have an appreciable effect on the sanitary quality of the supply since by the removal of objectionable esthetic qualities a higher bacterial efficiency would also be obtained.

I should further recommend that a copy of this report be transmitted to the Sidney Water Works Company and that they be advised that owing to the many factors associated with their water supply which affect its sanitary and esthetic qualities, it would be the part of wisdom and economy for them to employ an expert engineer to make a study of improvements along the lines suggested above and to advise them more fully and in more detail as to the best and most economical means for carrying out these and possibly other improvements to their supply.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

SIDNEY CENTER

ALBANY, N. Y., *September* 13, 1909.

EUGENE H. PORTER, M.D. *State Commissioner of Health*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of an investigation of the public water supply of the village of Sidney Center:

Sidney Center is an unincorporated village in the town of Sidney in the northwestern corner of Delaware county. It is situated on Carr's creek, a stream tributary to the Susquehanna river, about thirty-eight miles northeast of Binghamton. It has a station (Maywood) on the N. Y., O. & W. R. R., about eight miles east of Sidney.

It has a population of about 600, about a third of whom are directly connected with the public water works. The water is furnished by the Sidney Center Water Company of which Mr. F. M. Andrews, Roxbury, N. Y., is president, and Mr. H. B. Sewell, Sidney, N. Y., is superintendent and general manager.

The water works were installed in 1897 and consist of an impounding reservoir and about three miles of mains, ranging from four inches to six inches in diameter. There are about forty service taps, none of which are metered. The average daily consumption is estimated at about 330,000 gallons of which about 20,000 gallons are used for domestic purposes. The water is furnished by gravity under an average pressure of about seventy-two pounds per square inch.

The water supply is obtained from Herrick Hollow creek, at a point about one and one-half miles south of the village. The impounding reservoir is built at the edge of the stream and diverts only a portion of its flow. An earth embankment extends along the stream and at the lower end of the reservoir. The reservoir is uncovered. It is about 120 feet long and 180 feet wide. It has a maximum depth of 12 feet with an average of 7 feet, giving a storage capacity of about 500,000 gallons. The water before flowing into the mains passes through a charcoal and gravel strainer, about 7.5 feet by 3 feet in section, passing successively through a layer of gravel (pea to marble size) about three feet thick and a layer of charcoal five feet thick into a rubble masonry well about three feet deep. This straining system has plank walls and is located in the reservoir at its lower end.

The watershed is rather steep rolling country, the region consisting of high mountains with deep and wide valleys in between. The soil is sandy and gravelly and the rock is of a sandstone formation. Near a crossroad about 300 yards above the reservoir, Herrick Hollow creek divides into two branches, one from the west and the other from the east, each being about one-half mile long. The area of the watershed tributary to the reservoir is about one-half square mile. About one-half of the area is wooded, the rest being in part stripped idle land, and in part used for agricultural purposes. The ground is full of springs. The average annual rainfall is about thirty inches.

An inspection of the watershed was made on August 13, 1909, by Mr. C. F. Breitzke, assistant engineer. Five houses were found on the watershed having an aggregate population of about twenty-five. On the main stream there is one house just above the reservoir. This, however, is located on the other side of a public highway, and probably does not contribute pollution. One house is located on the east branch of the stream, about 500 feet distant, and near the head of the stream. The remaining three houses are on the west branch and all contribute pollution to the stream. The location of these houses and the character of the pollution from them is as follows:

1. *Lewis Perkins,* place located about 1,000 feet above reservoir. Streams flow through barnyard and receive drainage from stable and manure pile. Water in bed of stream near stable is oily in appearance, and the bed of the stream has a rusty appearance. Privy is located in springy ground about thirty feet from a small stream tributary to east branch of stream near junction with the west branch.

2. *Claude Dougherty,* place located about one-half mile above reservoir. A tributary stream having source in spring in barnyard receives drainage from manure pile.

3. *Alfred De Mond,* place located about three-eighths mile above reservoir, near head of stream. Privy is located in springy ground, about forty feet from stream. Stable is thirty feet from

stream. Wash water was discharged into stream at time of inspection. Pollution from this place serious.

As far as could be ascertained no typhoid fever has ever occurred in any of the houses on the watershed, neither is it prevalent in the village. The pollution contributed to the stream, however, has nurtured undesirable growths in the reservoir, which giving the water an exceedingly strong and disagreeable odor, have been the cause of the complaints to this Department which brought about this investigation.

The original pressure in the mains was about ninety-four pounds per square inch. At the present time it is about seventy-two pounds per square inch, indicating either an accumulation of sediment or tuberculation of the mains or to the dirty condition of the charcoal and gravel strainer in the reservoir, which has not been cleaned for a number of years. Ice cutting is allowed on the reservoir.

At the time of the inspection the flow in the stream was low, and was practically all ground water. Near the upper end of the reservoir the ground had an oily appearance, very similar to that observed at the Perkins place. The water in the reservoir was low and very turbid, and had a dirty green color. The reservoir was dirty and contained an accumulation of sediment in a putrefactive condition. The reservoir has no spillway the water backing up to the stream only a portion of the flow of which is diverted. There is accordingly practically no circulation of the water in the reservoir, the water being stagnant, filled with algae growths, and having a very strong and disagreeable penetrating odor. The gravel and charcoal strainer through which the water from the reservoir must pass apparently receives its water from the lower strata in the reservoir and has not been cleaned for several years.

The odor of the water furnished the consumers is at the present time so strong and disagreeable as to make it absolutely unfit to drink. It is of a penetrating musty character, and is due in part to algae growths in the reservoir, but largely to an accumulation of sediment and organic matter in that basin which is in a state of putrefactive decomposition.

Samples of the water were taken at the time of the inspection and sent to the State Hygienic Laboratory for chemical and bacteriological analysis. The results of this anlysis, together with that of a sample collected on May 8, 1908, by a representative of the laboratory are given in the table on page 375.

Owing to the lack of rainfall for a number of weeks prior to the inspection, the flow of Herrick Hollow creek at the time of the inspection was entirely ground water. When free from pollution a water in this vicinity should have normally a chlorine content of over 0.4 part per million, should show practically no nitrogenous organic matter and should be entirely free from bacteria of the B. Coli type. The above analysis gives 1.62 parts chlorine per million, shows a large amount of organic matter, gives an exceedingly high total bacterial count, and B. Coli were found present in every sample tested, even in quantities as small as 1/10 c.c. These results indicate a badly polluted water and confirm the findings of the sanitary survey.

The fact that the village has been free from typhoid fever is due to the fact that there has been none among the people of the watershed. Should, however, any communicable diseases occur on the watershed at points where the pollution occurs, the village would undoubtedly be subject to an outbreak of the disease.

In view of the foregoing I beg to submit the following conclusions and recommendations:

(1) There are upon the watershed certain points where either direct or indirect pollution of the water supply occurs. All such points of pollution referred to above and revealed by further and more detailed inspection of the watershed should be at once removed and steps taken to prevent their recurrence in the future.

(2) In case they experience any difficulty in removing the sources of pollution on their watershed, they should consider the question of application to this Department for the enactment of rules and regulations for the protection of their water supply.

(3) The strong disagreeable odor which at the present time makes the water unfit to drink is due to the accumulation of organic matter and algae growths in the reservoir. It is, therefore, highly desirable that steps be taken as soon as possible to drain and thoroughly clean this reservoir.

(4) To avoid stagnation in the reservoir and its resulting deterioration of the quality of the water, steps should be taken to provide a greater flow and eventually a better circulation of water

through the reservoir. This may be accomplished by providing a spillway at the lower end of the reservoir and diverting a larger and sufficient amount of the stream flow through the reservoir, allowing only the surplus above the necessary amount, such as would occur during seasons of rain, to flow in the stream.

(5) Since some stagnation and stratification may occur in summer during a dry season and low flow and at such times the lower strata may not be of so good a quality as the upper strata, it would be well to provide a new intake pipe line for taking water at different depths.

(6) Inasmuch as during the summer months the water in the stream is largely infiltration of ground water, it is impossible to guarantee freedom from algae growth unless the reservoir is covered. If it is not considered practicable at this time to construct a cover over the reservoir these growths may be partially kept under control by cautious application of copper sulphate under the direction of some expert familiar with its use.

I should further recommend that a copy of this report be transmitted to the water company and that they be advised that owing to the many factors associated with the present supply which affect its sanitary and esthetic qualities, it would be the part of wisdom and economy for the company to employ an expert engineer to make a study of improvements along the lines suggested above and advise them more fully and in more detail as to the best and most economical means for carrying out the above, and possibly other improvements to their supply.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

SOUTH GLENS FALLS

ALBANY, N. Y., *February* 1, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report of an investigation made by the Engineering Division in the matter of the public water supply of the village of South Glens Falls.

South Glens Falls is an incorporated village in Saratoga county. It is located on the south side of the Upper Hudson river and is directly across from the city of Glens Falls. It has trolley connections with the Delaware & Hudson Railroad station at Glens Falls and with Saratoga Springs.

The water supply of South Glens Falls is obtained from Baker and Wetsel brooks on the southwest outskirts of the village. The water is furnished to the consumers by the municipality under the direction of the board of trustees.

The main source of supply is now obtained from Baker brook and is supplemented when necessary by water from the old reservoir below the junction of Baker and Wetsel brooks. Baker brook is a small stream having its source in wooded springy ground east of the Hudson river and a drainage area of about 2.5 acres. Wetsel brook has a drainage area of about 3.5 acres. Its source is similar to that of Baker brook and lies between it and the Hudson river. In addition to these two streams there are two others from the east entering the old reservoir on the side. The total watershed of this reservoir is estimated at fifteen acres.

The water works were installed in 1896 and consisted of an impounding reservoir on the stream formed by the confluence of Baker and Wetsel brooks, a gate house with coke strainer, a pumping plant, a stand pipe, and five miles of mains, ranging from 6 inches to 14 inches in diameter. In August, 1908, a new impounding reservoir on Baker brook was added which is now being used as the chief source of supply.

The old reservoir has an earthern dam and is uncovered. It is a club shaped body of water, being about ten feet wide at its upper, and about eighty feet at its lower end. It is about 800 feet long and has an average width of about sixty feet. Its depth ranges from four feet, at its upper end, to about ten feet, at the lower, with an average of about five feet. The new reservoir has a masonry dam, is about thirty-five feet square, and has a depth of five feet with an estimated capacity of 46,000 gallons. The water from each reservoir passes through a charcoal bed in the gate house fifteen feet square and six feet deep and thence into receiving reservoir at pumping station.

The pumping station is a brick building 30 x 90 feet. The equipment consists of two 10 in. and 16 in. x 8½ in. x 10 in.

Worthington duplex pumps operated by steam, having an eight-foot lift and pumping against 180 feet head. The water is pumped from the receiving reservoir which adjoins the pumping station, has masonry walls and bottom, is 80 feet long, 32 feet wide, 19 feet deep and holds 12 feet of water. The water is pumped into a standpipe about one-quarter of a mile distant, situated in the south portion of the village. The standpipe is 18 feet in diameter, 120 feet high and has a capacity of 225,000 gallons.

South Glens Falls has at present a population of about 2500, of which about 70 per cent are directly supplied with water from the public system. There are 439 taps, none of which are metered. The average daily consumption is about 700,000 gallons, of which 500,000 gallons are used by the International Paper Company. The water is furnished to the consumers at an average pressure of 65 pounds per square inch.

An inspection of the watershed from which this water supply is taken was made on August 28, 1908, by Mr. C. F. Breitzke, assistant engineer. On the watershed of Baker Brook he found a house with a privy on a steep bank and two storm sewer outlets. The danger from these was pointed out to the health officer, Dr. Dolan, who accompanied our engineer on this inspection and who has since that time informed him that he took up the matter with the board of trustees and that they have provided other outlets for the storm sewers. The watershed of Wetsel Brook was not inspected. On the watershed of the streams tributary to the old reservoir from the east a number of serious cases of pollution were found. The board of trustees realize the danger from these streams and it is their intention to divert these streams to the Hudson river at a point below the reservoir.

Just previous to this inspection three cases of typhoid fever in South Glens Falls were reported to this Department by Dr. Dolan. An investigation of these cases was made at the time of the inspection and it was learned from Dr. Dolan that he had traced them to other sources than the public water supply.

Samples of the water for sanitary analysis were taken at tho time of the inspection and sent to the State Hygienic Laboratory. The results of this analysis in parts per million, together with other analyses of two other samples collected by a representative of the laboratory, are given on page 375.

From these figures it appears that while the organic matter present is moderate in amount, B. Coli has been found present in 1/10 cubic centimeter of the water. The results indicate a water of questionable purity.

In conclusion therefore, I beg to recommend that the attention of the board of trustees of the village of South Glens Falls be called to the insanitary conditions existing on their watershed and that they be advised that:

1. A thorough inspection of the watersheds of Baker and Wetsel brooks should be made and measures should be taken to remove all sources of pollution and to prevent their recurrence.

2. The streams entering the reservoir from the side are polluted, and it is therefore important that they carry out their intention to divert these streams from the reservoir.

3. In case any difficulties are experienced by them in removing pollution or if they otherwise find it impracticable to protect their water supply, they should consider the question of application to this Department for the enactment of rules and regulations, in accordance with sections 70 and 71 of the Public Health Law.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

SUFFERN

ALBANY, N. Y., *January* 26, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of an investigation made by the Engineering Division in the matter of the public water supply of the village of Suffern.

Suffern is an incorporated village in Rockland county, located on the peninsula between the Ramapo and Mahwah rivers near the New York-New Jersey boundary line. It is a station on the main line of the Erie Railroad and is a terminal of the Piermont Branch of that railroad.

The water supply is pumped from the Mahwah river in the eastern part of the village, from a point just above the dam forming Antrim Lake, and is furnished to the consumers by the municipality. Mr. Frank E. Wiley is secretary of the board of water commissoners.

Mahwah river is tributary to the Ramapo river just below Suffern on the New Jersey side of the boundary. It has a drainage area of about twenty square miles with a population of about 1,500. The main branch of this stream runs in a southwesterly direction at the foot of and parallel with the range of Ramapo mountains for a distance of over eight miles. Flowing into it from the east are several streams which drain a large area of gently sloping ground covered for the most part with a small second growth of timber and used for agricultural purposes. This watershed has good storage and, generally speaking, is by nature an excellent gathering ground for a public water supply.

The water works were installed in 1899, and consist of a pumping plant, one reservoir and eight miles of mains, ranging from four inches to twelve inches in diameter. The water before being pumped passes through a gravel and charcoal strainer into a pump well from which it is pumped directly into the mains, the surplus being stored in the reservoir.

The pumping station is a brick building 23 feet by 38 feet. The water passes from Antrim lake through a bank of gravel seven feet wide into a basin 8 feet by 10 feet, whence it passes into another compartment and vertically downward through a bed of charcoal 8 feet by 12 feet by 4 feet, and through a pipe into a pump well twenty feet in diameter and holding twenty feet of water. The equipment consists of two 8¼-inch by 10-inch Rumsey triplex pumps with a capacity of 450,000 gallons per day each, driven by twenty-five horse power gasoline engines. Each pump has an 8-inch suction pipe running to pump well, and in emergency one pump can pump directly from the lake.

The reservoir is located on a hill directly north of the village, about one-half mile northwest of the pumping station. It has concrete walls and bottom, and is uncovered. It is seventy feet in diameter, ten feet deep and has a capacity of 275,000 gallons.

Suffern has at present a population of about 3,000, about 75 per cent. of which are directly connected with the public supply.

There are 440 service taps, all of which are metered. The average daily consumption ranges from 95,000 to 160,000 gallons with an average of 125,000 gallons, including about 20,000 gallons per day for street sprinkling and manufacturing purposes. The water is furnished under an average pressure of eighty pounds per square inch.

An inspection of the Suffern watershed was made on January 7 and 8, 1909, by Mr. C. F. Breitzke, inspecting engineer of this Department. A portion of the village of Suffern lies north of the intake, and a number of houses have privies near the edge of Antrim lake. The local board of health and the board of water commissioners have had the residents put tight concrete vaults under these privies. Some of these privies, however, are very close to the water's edge, and for that reason are a menace to the purity of the water supply. Settlements were found at Ladentown, Viola and Tallman. It is estimated that there are about 1,500 people on this watershed. The inspection was made by driving over a considerable portion of the watershed and revealed some twenty-two direct sources of pollution listed below:

1. *Bailey place,* privy on the slope of a steep bank leading to the Mahwah river.
2. *Kakiat farm,* privy in rear of stable on slope, 100 feet from Mahwah river. Also on site of old foundry, privy 15 feet from, and stable at edge of river.
3. *Sherwood estate,* privy on slope seventy-five feet from a stream tributary to Mahwah river.
4. *Furman place,* privy at edge of small stream tributary to Mahwah river.
5. *Aaron Brown place,* near Ladentown, privy on steep slope about forty-five feet from stream.
6. *Daniel Antony place,* near Ladentown, privy on bank of stream.
7. *Margulies place,* Ladentown, stable with manure pile on edge of and privy seventy-five feet from stream.
8. *Hedges property,* Ladentown, privy on edge of stream.
9. *Secour property,* Ladentown, privy without a vault on a precipitous bank of Mahwah river.
10. *Charles Bronsell,* privy on slope sixty feet from stream.
11. *Joy place,* stable close to stream.

12. *Irving Cole,* stable and manure pile close to stream.

13. *Dawn's farm,* hen yard with garbage on slope at edge of stream.

14. *Sherman place,* Viola, privy five feet from and hen house and stable at edge of stream.

15. *Burtis place,* Viola, privy twenty-five feet from and stable at edge of stream.

16. *Hauf place,* Viola, privy seventy-five feet from stream.

17. *C. Ryan,* privy forty feet from water course.

18. *Spencer Wanamaker,* stable with manure pile at edge of and privy on slope forty-five feet from stream.

19. *George R. Mapes,* stable and manure pile at edge of stream.

20. *Henion place,* privy thirty-five feet from stream.

21. *Kopp place,* privy twenty feet from stream.

22. *Frederick place,* privy on slope about 100 feet from stream.

Owing to dry season the branch of the stream leading to Tallmann was dry, and, therefore, no sources of pollution in this vicinity were noted.

Samples of the water for sanitary analysis were taken from Antrim lake, from the basin after infiltration through gravel bank and from a tap in the pumping station and sent to the State Hygienic Laboratory. The results of this analysis in parts per million and those of other samples from Suffern analyzed during the past year are given in the table on page 375 of this report.

These results show the presence of considerable organic matter and that the so-called filtering through gravel bank and coke bed is largely only a straining process useful perhaps in removing large particles of suspended matter and some of the turbidity, but inefficient as far as improving the quality of the water is concerned. The large number of cases of pollution found on the watershed and the persistent presence of B. coli type in 1/10 c. c. of the water fully substantiate this fact and indicate an unsafe water for potable purposes.

In conclusion, therefore, I beg to recommend that the attention of the Suffern board of water commissioners be called to the insanitary conditions existing on their watershed and to make the following recommendations.

In view of the foregoing it would be desirable that the board of water commissioners exert their efforts along two lines:

1. The elimination of all direct pollution of their water supply.
2. The insuring of the safety of this supply from the indirect pollution which is bound to come from a large population on a watershed.

The inspection made by our inspecting engineer was necessarily incomplete. A thorough inspection ought, therefore, to be made as soon as possible by the board of water commissioners of the entire watershed of the Mahwah river and its branches. Measures should then be taken to remove all existing sources of pollution and to guard against their recurrence in the future.

The population on this watershed is large and is, owing to its proximity to New York city, constantly increasing. For this reason there would still exist, even if all direct sources of pollution were removed, an increasing amount of indirect pollution. It is, therefore, desirable that the board of water commissioners strengthen the barriers against contamination of this nature either by purchasing or controlling the land adjacent to the water courses and thus eliminating all sources of pollution on their watershed, or by installing a modern filtration plant to guard against pollution which must necessarily exist with a large population on the watershed.

If the board of water commissioners experience any difficulty in abating insanitary conditions or otherwise find it impracticable to thus protect their watershed, they should consider the question of application to this Department for the enactment of rules and regulations in accordance with the provisions of sections 70 and 71 of the Public Health Law.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

WALDEN

ALBANY, N. Y., *November* 19, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report of an investigation of the public water supply of the village of Walden.

Walden is an incorporated village in the northern part of Orange county, situated on the Wall Kill, about ten miles northwest of Newburgh. It is a station on the Wallkill Valley Branch of the New York Central and Hudson River Railroad and has trolley connection with Newburgh.

It has a population at the present time of about 4,000, practically all of whom are directly connected with the public water works. The water supply is furnished by the municipality under the direction of a board of water commissioners, of which Mr. Joseph T. Dawson is president. The water works were installed in 1892 and consisted in addition to the mains and stand pipe, of eight driven wells and a pumping station located in the southeastern portion of the village. In 1900 the supply failed and a second set of driven wells and pumping station were located about a mile southeast of the village.

The distributing system now consists of stand pipe 16 feet in diameter, 50 feet high, having a capacity of 72,000 gallons, or about one day's supply and nine miles of mains, ranging from 4 inches to 8 inches in diameter. There are 690 service taps, all of which are metered. The average daily consumption is estimated at 70,000 gallons. The water is pumped directly into the mains, the surplus being stored in the standpipe, and is furnished to the consumers under an average pressure of sixty pounds per square inch.

The two pumping stations located within and outside the village are known as Pumping Station No. 1 and Pumping Station No. 2, respectively. At Pumping Station No. 1 there are eight driven wells about 100 feet deep, driven through fifteen feet of loam and gravel, 15-20 feet of blue clay, and the remainder of distance through rock, the first sixty feet of which is shaly-limestone, and below which is a water bearing " pepper and salt " rock. At Pumping Station No. 2 there are also eight driven wells, four six-inch wells and four four-inch wells. Originally all eight were seventy feet deep, but later the six-inch wells were driven to a depth of 100-102 feet in order to secure a more abundant supply. At the present time all four of the six-inch wells and one of the four-inch wells are being used. The wells are driven through 5-8 feet of loam and gravel; ten feet blue clay; quick sand to depth of thirty-five feet; then rock. At depth of seventy feet, " salt and pepper " rock, a water bearing stratum of black and white grained rock, is reached.

Both pumping stations are 25 x 50 feet brick buildings with wooden trussed slated roofs. Each is equipped with a 60 h. p. boiler and one pump; Station No. 1 being equipped with a Buffalo 14 x 7¾ x 12 inch duplex pump with a rated capacity of 600,000 gallons per day, and Station No. 2 with a Buffalo 7¼ x 12 x 7¾ x 12 compound duplex pump with a capacity rated at 400,000 gallons per day. The pump at Station No. 1 is operated for four-five hours in the afternoon at the rate of 15,000 gallons per hour. The pump at Station No. 2 is usually operated from four-five hours in the morning and forenoon at rate of 10,000 gallons per hour.

An inspection of the water system was made on November 4, 1909, by Mr. C. F. Breitzke, assistant engineer. It was observed that Pumping Station No. 1 is located in a thickly-settled neighborhood in which a number of privies are located 200 feet to 500 feet from the driven wells. One privy located only about 600 feet distant was used by a family in which there were a number of cases of typhoid fever. The wells are under the pumping station and are protected from surface wash. As noted above, however, they have been driven through a shaly limestone formation.

Pumping Station No. 2 is located in an open field several thousand feet from the nearest dwelling. The wells are under the pumping station and are protected from surface wash.

Samples of the water were taken at the time of the inspection and sent to the State Hygienic Laboratory for chemical and bacteriological analysis. The results of these analyses together with others previously made are given on page 375.

The analyses show a high chlorine and nitrogen content, and that bacteria of the B. Coli type are at times present in the water even in quantities as small as one cubic centimeter. These results indicate that pollution of the supply takes place and that this centers about Pumping Station No. 1. This pollution, however, appears to be well mineralized in its passage through the soil, but at times as indicated by the presence of B. Coli the mineralization due to the filtering action of the soil is incomplete.

Walden has been recently experiencing an undue prevalence of typhoid fever. Within two months prior to the date of the inspection some twenty-seven cases have been reported. Report cards, however, have not been fully made out by the health officer in more than half the number of cases reported, and it has been practically impossible to obtain from him the detailed information necessary to make a full analysis of the typhoid fever situation.

It appears in this connection that Walden has been subject to previous outbreaks of typhoid fever, occurring more or less regularly, and usually in the fall of the year. Prior to 1905 no data with reference to typhoid fever are available. In the latter part of 1905, the first outbreak occurred, beginning in September and extending into November. The number of cases is unknown, but the health officer stated that the epidemic was quite severe. Again, according to the health officer, a mild epidemic occurred in the fall of 1906, but no records of cases are likewise available.

In the fall of 1907 the usual outbreak of typhoid again occurred, developing in November into a severe epidemic which lasted into March, 1908. The epidemic was investigated by Dr. F. J. Mann of this Department and attributed by him to the contamination of the milk supply. From August through December, 1908, the records show another outbreak of typhoid fever.

The following table gives a record of the number of cases of typhoid fever reported in Walden since January 1, 1907:

YEAR	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1907	0	0	0	0	0	0		0	0	0		27
1908	5	0	4	0	0			5	4			5
1909	0	0	0	0	0	1	1	3	11	13	......	......

From an examination of the available records of cases of typhoid fever in 1909 it appears that eight out of ten cases occurring in October for which complete records have been received had their onset between October 4th and October 7th; that they bear no relation to the sources of milk supply; and that they affect people of all ages and stations in life. They appear to be scattered uniformly throughout the village, with the exception of the section east of the railroad, which, according to Dr. Whitehead, the health officer, has in general been practically free from typhoid fever.

The fact that this section has escaped the prevalence of typhoid fever which has regularly occurred in all other sections of the village, is not without significance. Pumping station No. 1 is on the west side of the railroad tracks. During the morning and forenoon it has for a number of years been customary to fill the mains and standpipe with water from station No. 2. In the afternoon station No. 1 is put in operation and the needs of the village supplied. The population east of the railroad tracks is small and this section is supplied directly from the main leading from station No. 2. The standpipe is south of the main portion of the village and receives only the surplus water not required by the consumers. When the pumps are in operation the village is supplied from the pumps directly. Therefore, when station No. 1 is in operation the section of the village west of the track is supplied with water from the wells at that station and the water in the standpipe continues to remain in the greater part from station No. 2.

It appears therefore that the section of the village east of the railroad tracks is supplied with perhaps the exception of a little admixture with station No. 1 water in the afternoon entirely with water from station No. 2 and this doubtless accounts for its practical freedom from typhoid fever.

In this connection it is also interesting as well as important to note that on account of litigation between the village and a certain farmer in regard to the lowering of the ground water level at station No. 2 and the preparations which were being made for tests, station No. 2 was out of commission for nearly a week and water was pumped continuously from the wells at station No. 1

from Monday, September 13, 1909, 8 a. m., to Friday, September 17, 1909, 8 p. m. At noon on Sunday, September 12, 1909, the standpipe was filled with water pumped from station No. 2. On Friday, September 17, 1909, at 8 p. m., in spite of the fact that pumping from station No. 1 had been continuous, the yield from the wells at this station was so small that the water was all out of the standpipe and at elevation 57 in the mains, the bottom of the standpipe being arbitrarily assumed at elevation 100.

It is very likely that this heavy draft upon the wells caused a disturbance of the ground water table for a considerable distance from the wells probably resulting in the sudden release of an increasing amount of pollution from contaminating sources and owing to the increased hydraulic slope of the ground water promoted its more rapid travel to the wells. In other words, an unusual dose of infection of the water supply may have occurred which seems to be consistent with the outbreak of a large number of cases early in the month of October.

In view of the foregoing, I beg, therefore, to submit the following conclusions:

(1) Considering the conditions surrounding these two well supplies and the analyses made of samples of water from them, it appears that the water obtained from the wells outside of the village is of good sanitary quality, but that the water obtained from the wells within the village limits is subject to pollution.

(2) The chemical as well as bacteriological analyses of the water from the wells within the village show that the pollution is at times well mineralized, but that at other times mineralization is incomplete and that at these latter times the contamination is active.

(3) The water obtained from this source of supply is undoubtedly responsible for most of the typhoid fever which has occurred somewhat regularly in the fall the past few years.

(4) Whereas it may be possible for the village to remove much of the pollution by the construction of a sewerage system, it is doubtful if such means would remove it all or be an effective and practical safe-guard.

I would, therefore, recommend that the attention of the village authorities of Walden be called to the pollution of the driven wells at pumping station No. 1 and that they be advised that it would seem, in view of the above conclusions, that the only reasonable course for the village to pursue in order to remove the cause of the typhoid fever which has been prevalent in the fall of each year, would be to abandon the wells located at station No. 1 and to seek an additional new supply from some new wells not subject to pollution, or to secure an additional and independent and pure surface supply.

Under the circumstances it would seem advisable for the Walden board of water commissioners to retain the services of some expert engineer on water supply to make a careful study of the problem and to advise them definitely as to the best means of providing an additional supply of pure water.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

WASHINGTONVILLE

ALBANY, N. Y., *November* 29, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:—I beg to submit the following report of an investigation of the public water supply of the village of Washingtonville.

Washingtonville is an incorporated village in the central part of Orange county about seven and one-half miles northeast of Goshen and ten miles southwest of Newburgh. It is situated on Moodna creek and it is a station on the Newburgh branch of the Erie railroad.

It is a population of about 700 of whom about half are directly supplied from the public water works. The water works are owned by the village and are under the control of the village board of trustees of which Mr. Thomas Fulton is president.

The water works were installed in 1895 and consist of an impounding reservoir and about 4 miles of pipe ranging from 4 to 10 inches in diameter. There are about 75 service taps, none of which are metered. The average daily consumption is estimated at about 20,000 gallons. The water is furnished by gravity under an average pressure of 75 pounds per square inch.

The water supply is taken from a stream tributary to Moodna creek at a point one and three-fourths miles southeast of the village. The reservoir has a masonry dam and is uncovered. It has an area of about a half acre and a storage capacity of about a million gallons or fifty to sixty days' supply. The water before entering the mains passes through a layer of charcoal 8 feet by 10 feet and 6 feet deep.

The stream from which the water supply is taken, has its source at a point three and a half miles southeast of the village at the head of a deep valley lying between two ridges of the Schunemunk mountains, whence it flows in a southwesterly direction for a little over a mile, thence northwesterly for about a mile, and thence northerly for about a mile to the reservoir. About three-fourths of a mile south of the reservoir the main stream is joined by a small branch from the west. The watershed is about three square miles in area. Most of it has been stripped of its woodland and with the exception of the immediate vicinity of the Schunemunk mountains is being used for agriculture purposes. The topography is rather steep in its character and the underlaying rock is sandstone.

An inspection of this watershed was made on July 1, 1908, by Mr. C. F. Breitzke, assistant engineer. There were ten houses on the watershed, having an aggregate population of about 50. With the exception of three places contaminating sources were located at a safe distance from the streams and in general sanitary conditions were good. The first of these, the Davitt place, is but a few hundred feet above the reservoir and has a privy not far from the edge of a precipitous bank of a small tributary stream. The second, the Benjamin place, is just above the Davitt place and has a privy at the edge of a stream and a manure pile 50 feet from it. At the third place, the Gregory place, located about a mile above the reservoir, the stream flows through a barnyard and within 50 feet of a manure pile.

The water in the reservoir was somewhat turbid and was filled with algae growths which gave it an unpleasant taste and odor.

These growths are doubtless nurtured in part by the pollution from the places referred to above and in part by the accumulation of organic matter in the reservoir itself. These aesthetic features, while not of themselves dangerous to health, are disagreeable to the senses of sight, taste and smell, and may affect health indirectly, and it is, therefore, highly desirable that measures be taken at once by the village board of trustees to remove them.

In regard to the measures which might be adopted to lessen troubles from tastes and odors, it may be said that whereas it is not always possible to entirely prevent these growths nor to remove entirely the effects of them, it is possible to largely eliminate them by means which will either prevent these growths or which will remove these tastes and odors when they have once become established. Removal of pollution and cleaning the sides and bottom of the reservoir will frequently so reduce the food supply as to effect the removal of these organisms for a considerable period. When, however, growths have actually developed in a reservoir to such an extent as to cause undesirable tastes and odors, it is only possible to eliminate these by corrective measures.

The control or elimination of these growths may be accomplished by the cautious application of copper sulphate, but this must be done only under the supervision of some expert perfectly familiar with its use since copper sulphate is a poisonous compound which if not properly applied may kill the fish in the reservoir and affect the health of the consumers. In the application of corrective measures simple aeration has been found to largely remove if not eliminate the tastes and odors. Aeration supplemented by filtration will accomplish a complete removal of tastes and odors even when growths have developed in a reservoir to an objectionable extent. As to whether any or all of these methods should be adopted in any case will depend on a study of local conditions, particularly in regard to cost and seriousness of the trouble experienced.

Samples of the water were taken at the time of the inspection and were sent to the State Hygienic Laboratory for chemical and bacteriological analysis. The results of this analysis are given on page 375 in parts per million.

A glance at these figures shows that the chlorine is twice the normal for this region, fecal organisms were found present in quantities of water as small as 1 c.c. and the amount of nitrogenous organic matter is rather high. The results confirm the results of the inspection of the watershed in that they indicate that contamination of the water supply is taking place.

It is evident then that immediate steps should be taken by the village authorities to improve the water supply in such a manner as will remove not only all danger from contamination but also the objectionable tastes and odors.

In view of the foregoing, therefore, I recommend that the insanitary conditions on this watershed be brought to the attention of the Washingtonville village board of trustees, and that they be advised that —

1. A thorough inspection of the watershed of the stream from which their water supply is obtained should be made and steps taken to remove all existing sources of contamination of their supply and to guard against their recurrence in the future.

2. In case they experience any difficulty in removing sources of pollution of their water supply, they should consider the question of application to this Department for the enactment of rules and regulations for the protection of their water supply.

3. In case the tastes and odors should become objectionable their removal may be accomplished by (a) removing pollution on the watershed and cleaning the sides and bottom of the reservoir; (b) controlling algae growths in the reservoir by the cautious application of copper sulphate; (c) removing tastes and odors by aeration alone or by aeration and filtration.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

WATERLOO

ALBANY, N. Y., *November* 11, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR: — I beg to submit the following report of an investigation of the public water supply of the village of Waterloo.

Waterloo is an incorporated village in the northern part of Seneca county, eighteen miles west of Auburn. It is situated mainly on the northside of the Seneca river and Seneca canal and is a station on the Auburn division of the New York Central and Hudson River railroad and on the Seneca Falls branch of the Lehigh Valley railroad. It also has trolley connections with Geneva and Seneca Falls.

Waterloo has a population of about 4,200, about 55 per cent. of whom are directly connected with the public water works. The water supply is furnished by the Waterloo Water Works Company of which Mr. W. D. Boyers of Scranton, Pa., is president and Mr. C. H. Ross of Waterloo is superintendent. The water works were installed in 1886 and now consist of a pumping station and nine miles of mains ranging from four inches to fourteen inches in diameter. There are about 570 service taps, of which six are metered. The average daily consumption is estimated at 330,000 gallons and is furnished under an average pressure of fifty pounds per square inch.

The water supply is obtained directly from the Seneca river at a point about one-quarter mile above the pumping station and the western outskirts of the village. The intake consists of a 15-inch pipe which is screened and projects about twelve feet from shore, the river being about fifty feet wide at this point. The intake was originally located near the pumping station, but was moved to its present location to avoid pollution from a stream befouled by wastes from a soap factory and entering the Seneca river about 900 feet above the pumping station. The old intake, however, still exists and is used as an emergency intake.

The pumping station is a two-story brick building equipped with two 80 h. p. boilers and two Worthington 9 x 16 x 10¼ x 10 inches duplex pumps having each a suction lift of about ten feet and a rated capacity of a million gallons a day. The pumps are operated alternately and continuously, two stationary engineers being employed.

Originally the works included a settling reservoir and a standpipe. The settling basin is located between the pumping station and the river and is about 40 x 80 feet in plan and 10 feet deep. It has, however, been out of use for a number of years.

The standpipe was located on the opposite side of the pumping station. It was 15 feet in diameter and 130 feet high. It was erected in 1886 and remained in service until June 9, 1908, when it failed by bursting during a thunder storm. For an account of this failure see *Engineering News*, June 25, 1908, page 681.

The Seneca river is the outlet of Seneca lake and flows in a northeasterly direction to Three Rivers, at the boundary of Oswego and Onondaga counties, where it unites with the Oneida river to form the Oswego river. At the outlet of Seneca lake it has a drainage area of 707 square miles and a minimum flow of 98 to 206 cubic feet per second. Above the intake at Waterloo it has a drainage area of about 729 square miles. A description of the topography of its watershed is included in a special report by Prof. Ogden on the Oswego river watershed investigation published in the Twenty-eighth Annual Report of this Department (1907), pp. 577–600, and will therefore not be included in this report.

An inspection of the water works and the Seneca river at Waterloo was made on September 9, 1908, by Mr. C. F. Breitzke, assistant engineer. During the past summer Mr. W. J. McKee, Inspector of this Department, made an inspection of the main stream from the Waterloo intake to the outlet of Seneca Lake.

The Seneca river forms for most of the distance to Seneca lake the Seneca canal and is subject to pollution from canal boats. On the south side the banks are rather low and there is a strip of swampy land extending almost to Seneca lake. About one and one-fourth miles above the intake Kendig creek enters the river from the south. This drains a settled area of about sixteen and five-tenths square miles and is a sluggish swampy stream about twenty-five feet wide at its mouth, filled with marshy growths. On the north side the bank is high and a highway runs alongside of the river. North of the highway there is a swamp varying in width from fifteen to fifty feet extending almost the entire length of the stream and draining through a number of culverts under the highway into the stream.

At a number of points the highway comes close to the river, and at these points houses with privies are located thirty to fifty feet from the stream. In general, however, the houses and barns are 150 to 200 feet back from the river, until the outskirts of Geneva are reached. Here there are many houses having overflowing privies located five to twenty feet from the banks and in some cases directly over the stream.

The outlet of Seneca lake is at the northeast corner about two miles from the city of Geneva which lies at the northwest corner, extending along the lake front to the south and to the east. The Cayuga and Seneca canal begins in front of the city and furnishes an outlet for so much of the water of the lake as is needed for navigating the canal. It runs along the north end of the lake and joins the Seneca river about a third of a mile northeast of the lake.

The sewerage from some 13,500 people in Geneva enters Seneca lake about 600 feet from shore. The outlet of one of these sewers is but a few hundred feet from the entrance to the canal. In addition to this, the canal receives pollution from various streams traversing the city. Directly north of the lake there is a tract of nearly level ground rising to an elevation of about ten feet above the lake and extending back three-quarters of a mile to the north line of the city. The drainage from this tract and also a strip of land to the west, about one-half of a mile wide and rising to an elevation of sixty feet above the lake, is carried off through Marsh creek which enters the city from the north and empties into the canal 2,000 feet from the inlet lock. This stream is a feeder to the canal and is liable to freshets which overflow its banks and inundate about forty acres of land within the city limits. At the extreme northwest corner of the lake another creek enters the canal. It flows through a ravine, crossing the streets diagonally and takes its rise about one mile to the northwest. About 500 feet south of this creek, Castle creek enters the canal basin outside of the guard-lock. This stream has quite a large drainage area to the west, passing through back yards and under buildings. South of

Castle creek there are a number of other streams entering the lake, chief among which is Cemetery creek, which enters in front of the main business portion of the city, flowing from a generally westerly direction through the centers of blocks and diagonally across them in a deep ravine for nearly a mile.

At the time of the inspection the water in the river had a dirty appearance. The current was small and in places the water was covered with a green scum. It was stated that at times the tastes and odors are so bad that the water is unpalatable and at times unfit to drink.

Samples of the water were taken at the time of the first inspection and sent to the State Hygienic Laboratory for chemical and bacteriological analysis. The results of this analysis together with those of other samples collected from time to time by representatives of the laboratory and by the health officer, and also some analyses of samples taken from Seneca lake (Geneva water supply) about three miles above the points of discharge of Geneva sewage, are given on page 375.

These results show the presence of a large amount of nitrogenous organic matter in the water supply of Waterloo. The number of bacteria is high and B. Coli have been found present at all times in amounts of the sample analyzed as small as 10 c.c. and 1 c.c. and in all samples except two of the 0.1 c.c. inoculations, confirming what is perfectly evident from the insanitary conditions observed at the time of the inspections reported above. The high chlorine is probably due to salt works at Watkins near the south end of Seneca lake.

The analyses made of Seneca lake water in connection with the Geneva water supply, i. e. of Seneca lake before receiving the sewage of the city of Geneva also show the presence of considerable nitrogenous organic matter and of B. Coli in all cases of 10 c.c. and 1 c.c. inoculations of samples and in some of the 0.1 c.c. inoculations of samples, showing that the water in Seneca lake, even three miles above the entrance of Geneva sewage, is contaminated.

The pollution of the water supply was made the subject of special comment by Prof. Ogden in his report on the sanitary condition of the city of Geneva, submitted on July 27, 1909, and in which he stated that the water supply is influential in causing typhoid fever in that city. Finally in his conclusions and recommendations he was of the opinion that the water supply of Geneva can be made permanently safe only by some method of purification.

An attempt was made to trace the affect that the use of the polluted water supply from the Seneca river had upon the outbreak of typhoid fever at Waterloo. The records of cases, however, submitted by the health officer have been so incomplete that no definite conclusions could be reached. As an example of the incompleteness of these records it may be stated that in 1907 while only one case of typhoid fever was reported the mortality records show six deaths. According to the usual ratio of deaths to cases of typhoid fever, the typhoid fever mortality returns for 1907 would indicate the existence of some sixty or eighty cases of that disease. The records, such as they are, however, show seven cases for April, 1908, and six cases distributed through four months in 1909, showing that even by these incomplete records typhoid fever is occasionally prevalent. That typhoid fever does not seem to be more prevalent is in all probability due largely to good fortune and in part to the sluggish flow of the Seneca river and canal which has allowed a large portion of the infectious matter to settle out and has caused the typhoid germs to become attenuated and less virulent. It is further probable that the objectionable esthetic quality of the water has driven many of the residents to seek other sources of supply such as wells and bottled waters and thus may in a measure have lessened the danger of infection.

Notwithstanding the lack of evidence showing the prevalence of typhoid fever, resulting from incomplete records it is evident that the water supply receives considerable contamination of a dangerous nature; for in addition to the pollution received by Seneca lake which is sufficiently serious to have led to the condemnation of its use without purification as a source of water supply by the city of Geneva, the Seneca river receives pollution from sewage and drainage of Geneva through the Seneca and Cayuga canal and directly from drainage and privies along its banks and canal boats.

That this pollution is taking place and that the contamination is active is confirmed by the chemical and bacteriological analyses which have been made of the water supply of Waterloo from time to time. These analyses indicate the presence of a large amount of nitrogenous organic matter and an excessive number of bacteria of that type which indicates fecal pollution.

In view of the foregoing, I therefore recommend that a copy of this report be sent to the Waterloo Water Works Company and to the local board of health and that they be advised that the water supply now taken from the Seneca river is seriously contaminated and a menace to the health of the community and should, therefore, either be purified or be abandoned in favor of some other source of supply.

As to which of these two means of securing a pure supply would be the better and more economical to develop cannot be stated now from the information available. Under the circumstances it would seem advisable for the Waterloo Water Works Company to retain the services of a competent expert to make a careful study of the problem and to advise them definitely as to the best means of providing a safe and wholesome supply of water.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

WEST CARTHAGE

ALBANY, N. Y., *September* 16, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of an investigation to determine the suitability of Pleasant lake as a source of public water supply for West Carthage, made at the request of Messrs. Van Allen and Meeker, attorneys for certain citizens of that village.

West Carthage is an incorporated village in the southeastern part of Jefferson county situated on the west side of the Black river, fifteen miles east of Watertown. It is across the river from Carthage at which place it has connections with the Rome, Watertown and Ogdensburg Division of the New York Central railroad.

West Carthage has a population at the present time of about 1,600, about three-fourths of whom are directly connected with the public water works. The water works are owned by the village. The water is furnished, however, by the village of Carthage by special agreement. The water works were installed in 1895 and consist simply of five miles of mains ranging from 4 inches to 10 inches in diameter. There are about 300 service taps, none of which are metered. The average daily consumption is unknown. The water is furnished by gravity under an average pressure of about 80 pounds per square inch.

The Carthage water supply is obtained from Cold creek in the town of Croghan, Lewis county, at a point 14⅔ miles east of Carthage. Cold creek is one of the headwaters of the Indian river and has an average daily flow of 2,000,000 gallons. The reservoir has a capacity of 1,000,000 gallons and is at an elevation of 200 feet above the village. The pipe line has a carrying capacity of 1,000,000 per day. Above the reservoir dam the stream has a drainage area of one and a half square miles. The water is said to issue from a spring at the foot of a sand hill and to flow over sandy barren country free from contaminating sources. An analysis of the water made at the Lederle Laboratories in November, 1906, was reported — "This water is of excellent quality, pure, uncontaminated, very soft, and admirably adapted for use for all purposes of a municipality." A copy of this analysis together with another made of a sample taken by a representative of the State Hygienic Laboratory on December 12, 1908, are given in the appended table.* These analyses indicate a soft water of good sanitary quality.

Owing, however, to a disagreement in regard to rates, the citizens of West Carthage some time ago voted favorably upon a proposition to extend the water works to "Otis spring" and consequently obtained permission to do so from the State Water Supply Commission. This spring is located on a wooded lot in the town of Denmark, Lewis county, three and one-half miles south of the village in a shaly limestone formation. This spring suddenly went dry one day during the past summer and on investigation it was found that it is fed at a point about a mile northwest through a fissure by water from a small stream flowing from Pleasant lake. The water in the stream being low and all of it going down through the fissure, a farmer in order to get water for his cattle dammed up the stream at the entrance to the fissure and diverted its flow. The village board of trustees, therefore, now propose to raise the water level of Pleasant lake and supply the spring through the fissure.

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* See table, page 375.

Pleasant lake is a long and narrow lake lying east and west in the town of Champion, Jefferson county, near Lewis county boundary line and is about three and one-half miles southwest of, and about 260 feet above, the village. It is about one and one-half miles long and has an average width of about 1,000 feet. It has an average depth estimated by members of the village board of trustees who have made soundings at twenty feet giving a storage capacity of about a billion gallons. Along the shores and at its lower end the lake is quite shallow, the water at these places being filled with marsh grasses, etc. About 500 feet from the lower end the water is about thirty feet deep, but becomes rapidly very shallow on approaching the outlet.

The lake has a drainage area of about three square miles, the area being almost rectangular, one mile wide and three miles long. The stream flowing into the lake has its source in a swampy area about one and one-half miles west of the lake and flows due east in a deep valley. The underlying rock is Trenton limestone.

An inspection was made of this watershed on August 27, 1909, by Mr. C. F. Breitzke, assistant engineer of this Department. There were fourteen houses on the watershed having an aggregate population of about sixty. With the exception of a summer hotel and picnic grounds on the north shore about seven-eighths mile above outlet of the lake these places were located at a reasonably safe distance from the stream. At the summer resort a privy without a vault was found at the edge with excreta on the ground at times submerged, a sink drain discharging on the ground within a few feet of the shore and a stable at the edge of the lake.

Samples of water from Otis spring and Pleasant lake near its outlet were taken at the time of the inspection and sent to the State Hygienic Laboratory for chemical and bacteriological analysis. The results of this analysis are given in the appended table.*

From the analyses in this table it appears that the Pleasant lake water while not of bad quality, is nevertheless inferior to the present supply containing about three times as much organic matter, chlorine, and hardness as the present supply. B. Coli appear to be present in quantities as small as one-tenth cubic centimeter. The sample from Otis spring also gave evidence of B. Coli or intestinal bacteria, showing that practically no purification of water takes place in its passage through the fissure from the stream to the spring.

In view of the foregoing, I beg to submit the following conclusions and recommendations:

1. The water from Otis spring is surface water from Pleasant lake and is practically unpurified in its passage through the ground.

2. The sanitary conditions surrounding Pleasant lake and the evidence shown by the analyses indicate that this water is not only inferior in quality to the present supply obtained from Carthage, but with the pollution that now occurs would be a menace to the health of the community unless all existing sources of pollution are effectively removed and efficient steps taken to prevent similar pollution in the future as the population around the lake increases.

3. Aside from the strictly sanitary or hygienic quality the wholesomeness of this supply is considerably impaired relative to the present supply owing to the swampy source of the lake water and the shallow and marshy character of the lake itself.

I, therefore, recommend, that the village of West Carthage either do not attempt to use Pleasant lake as a source of supply or in case they do, that they take efficient measures to remove pollution and prevent future pollution or first purify the water by filtration. It is possible that other sources of supply in this region are available which are purer and possibly equally economical and it would be desirable that if the village still wishes to secure an independent supply to have a study made by some competent water works engineer and receive his advice as to the best and most practicable source to develop.

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* For table see page 375.

If the village authorities still desire to use Lake Pleasant without purification as a source of supply and they meet with any difficulty in removing pollution and in preventing its recurrence, they should consider the matter of applying to this Department for the enactment of rules and regulations for the protection of this supply.

I further recommend that a copy of this report be sent to the village authorities of West Carthage for their instruction and consideration.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

WHITE PLAINS

ALBANY, N. Y., *May* 24, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report on an investigation made by the Engineering Division in the matter of public water supply of the village of White Plains.

White Plains is an incorporated village in Westchester county having a population of 11,579 in 1905. It is a station on the Harlem Division of the New York Central railroad and has trolley connections with the Hudson River Division at Tarrytown and with the New York, New Haven & Hartford railroad at Mt. Vernon and at Mamaroneck.

The waterworks were installed in 1886, an additional reservoir being added in 1906. The water supply is obtained from streams and in part from wells. The water is furnished to the consumers by the municipality. Mr. John Heeney is superintendent of water works. About 90 per cent. of the population are connected with the public mains. The average daily consumption is about 980,000 gallons distributed approximately as follows: domestic, 700,000 gallons; public, 270,000 gallons; commercial, 10,000 gallons. There are about 1,800 service taps, 90 per cent.

of which are metered, and about thirty-two miles of pipe ranging from three inches to 16 inches in diameter. The water is pumped into a standpipe from which it is distributed under an average pressure of eighty pounds per square inch.

The water supply is obtained by pumping from wells, which intercept the leakage from uncovered storage reservoirs. The well system consists of five caisson wells, twenty-five feet in diameter and twenty-five feet deep, constructed of 20-inch brick plastered on both sides. The water is drawn from a sand layer at the bottom and is estimated at 550,000 gallons per day.

These wells are located in marsh land near the northeast boundary of the village. The marsh material consists of a varying depth of peaty matter ranging from five to fifty feet, beneath which is a layer of sand and gravel. In September, 1907, an 8-inch well was driven to a depth of eighty-six feet and showed the following stratification: Earthy peaty material, eighteen feet; sand and gravel, ten feet; clay, six feet; sand and gravel, twenty-two feet; and then rock. A strainer was lowered and the pipe pulled back. A test of this well, however, gave only ten gallons a minute and it was abandoned.

Just beyond the wells on higher ground are two uncovered impounding reservoirs. The upper one has a capacity estimated at 90,000,000 gallons. It has a masonry dam, covers an area of about seventeen acres and impounds water from several small streams having a combined drainage area of 248 acres.

The other reservoir has an estimated capacity of 130,000,000 gallons and is located immediately below the other, the difference in elevation of flow lines being about forty feet. It has an earth dam, a water surface of twenty-two acres, and a drainage area including that tributary to the upper reservoir of 521 acres.

Water from these reservoirs flows into a well thirty feet in diameter and twenty-five deep from which it is pumped into the mains by a triple expansion, direct acting, condensing duplex pump 10 and 16 and 25-inch x 14 x 18-inch and a duplex compound pump 18½ and 12-inch x 12 x 10-inch, both of the Worthington make.

The delivery system is connected with a standpipe located on a hill about one-half mile north of the business part of the village.

This standpipe is eighty feet high, twenty feet in diameter, and has a capacity estimated at 187,000 gallons. An average pressure in the business section of eighty pounds per square inch is maintained. In case of fire in an elevated portion of the village, the gate leading to the standpipe is closed by an electrical contrivance, and the pressure can be increased to 150 pounds per square inch.

An investigation of the sanitary condition of the watershed was made on June 26, 1908, by Mr. C. F. Breitzke, assistant engineer of this Department. The area of the watershed tributary to the reservoir is 541 acres, 248 acres of which is owned by the village, and the balance acquired but not yet paid for. All buildings have been removed from the portion owned by the village. On the other portion there are about a dozen houses which will be removed as soon as the awards are paid, although these houses are not directly a menace to the safety of the water supply.

On the slope below the dam of the lower reservoir are two houses having privies. The dam is leaking badly and these privies are on the line of drainage to the wells. Northwest of the wells along the Kensico road there are a number of houses maintaining privies near and have house drains discharging into a stream which flows through the swamp within a few feet of the wells.

Samples of the village water were taken for analysis from a tap at the pumping station at the time of the inspection. The results of this analysis together with those of other samples collected during the past year by representatives of the Laboratory Division, are given in the accompanying table on page 375.

While the organic content shown by these analyses is not great, the high chlorine and the fact that the B. Coli type have been repeatedly found not only in 10 c.c. and 1 c.c. samples, but also in quantities of water as small as 0.1 c.c., indicates that the quality of this water is open to question.

The sanitary survey of the watershed revealed certain undesirable features connected with the supply. The wells are located in a swamp, a stream receiving drainage from privies and sewage flows through the above swamp within a few feet of two of the wells, and two loose-vaulted privies just below the reservoir dam are directly in the path of the water leaking from the reservoir and intercepted by the wells.

Owing to the small population on the watershed, it appears that the contamination of the supply indicated by the analysis, may be due to concentrated pollution at some one or two points such as the two wells near the small stream receiving pollution from houses on the Kensico road, wells near the pumping station, etc. It is also possible that the pollution may come from an accumulation of filth in the low swampy drainage area in which the wells are located.

From the data on hand it is impossible to determine the exact point at which pollution of the supply takes place, and it is evident that a further and detailed study of the problem is necessary, such as analyses of individual samples of water from each of the walls and reservoirs, etc.

In conclusion, therefore, I recommend that the attention of the White Plains water authorities be called to the insanitary conditions associated with their water supply and that they be advised that:

1. The analysis of the various samples taken during the past year indicates a water of questionable purity.
2. They should remove all preventable pollution such as derived from the small stream receiving sewage and other pollution from houses on the Kensico road and northwest of the wells, and from the privies located between the reservoir dam and the wells.
3. A further study, such as a detailed inspection of the watershed and analyses of samples of water from the different wells and the two reservoirs should be made to locate the point of pollution.
4. In case this pollution cannot be effectively removed or determined, it would be a wise foresight to consider the filtration of the supply.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

WILLIAMSVILLE

ALBANY, N. Y., *August* 20, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR: — I beg to submit the following report of an investigation of the public water supply of the village of Williamsville.

Williamsville is an incorporated village in the northern part of Erie county, about ten miles east of the business center of Buffalo and four miles from the Buffalo city line. It is situated on Ellicott creek, is a station on the Niagara Falls branch of the Lehigh Valley Railroad and has connections with Buffalo by trolley.

At the present time Williamsville has a population of about 1,000, about 40 per cent. of whom are directly connected with the public water works. The water is furnished to the consumers by the municipality under the direction of a board of water commissioners of which Mr. Charles Gotwalt is president. There is no superintendent of water works, the members of the board looking after the works jointly.

The water works were installed in 1895 and consist of one collecting reservoir, a standpipe, and about three miles of pipe ranging from four inches to twelve inches in diameter. By special arrangements with the Williamsville Electric Railway Company the water is pumped from the collecting reservoir to the standpipe. There are about 100 service taps, none of which are metered. The average daily consumption used for domestic and public purposes is about 70,000 gallons, the water being furnished to the consumers at an average pressure of about forty pounds per square inch.

The water supply is obtained from springs located in the southern part of the village about a block from Main street. The collecting basin is a rectangular rubble masonry structure with an earth bottom and covered over with a triangular trussed roof. It is about fifty feet long, thirty feet wide, and eight feet deep, the water standing to a depth of five feet, giving a storage capacity of 55,000 gallons. The basin is located in low and springy ground and in general receives water from all directions. The chief sources of supply, however, are two springs located respectively near the northeast and southeast corners of the reservoir. The standpipe is located about 150 feet northwest of the collecting reservoir and is a steel cylindrical tank 12½ feet in diameter, 100 feet high and having a capacity of about 80,000 gallons.

The water is pumped from the reservoir as needed, the standpipe usually being pumped full twice a day in the forenoon and in the evening. The pumps are located in the electric power-house on Main street and consist of two Snow 8″ x 12″ x 8½″ x 12″ steam duplex pumps with a rated capacity of 750,000 gallons per day, having a suction lift of 2-3 feet and pumping against a pressure of forty-two pounds per square inch when the standpipe is full.

The boilers at the power-house are supplied by pumping water from Ellicott creek which is not so hard as the village supply. While none of this creek water has ever been used to supplement the village supply, it is not unlikely that it would be in the case of a large conflagration, for the present supply appears to be just sufficient to meet the daily consumption, and it would be well in connection with this report to call the attention of the village authorities to the fact that this stream is subject to pollution and is not suitable for a potable supply without purification.

The topography of this region is almost flat. The soil consists of a thin layer of loam and hardpan underlain by a limestone and shale formation. Most of the land is used for agricultural purposes.

An inspection of the watershed was made on August 6, 1909, by Mr. C. F. Breitzke, assistant engineer. The top of the collecting reservoir wall is at the surface of the ground. A small ditch draining several acres of farm land and crossing the road east of the reservoir flows near the southeast corner of the reservoir. The bottom of the reservoir was covered with sediment and is in need of a thorough cleaning. The health officer, Dr. Baker, reports the village water at times of freshets or heavy rains to be cloudy and roily. It appears, therefore, that the collecting reservoir is subject to pollution by surface wash.

The collecting basin and springs are located in a compact limestone and shale formation and situated at the edge of the village not far from Garrison and Division streets. A sanitary survey of the surroundings revealed the following:

1. *Brown place,* northwest corner of Garrison and Division streets. Cesspool is located about 150 feet and privy about 175 feet from collecting reservoir and springs.

2. *House opposite Brown place,* northeast corner of Garrison and Division streets. Privy located about 300 feet from reservoir and springs.

3. *Lee place,* on south side of Division street, east of Garrison street. Privy and cesspool about 175 feet from collecting reservoir and springs.

4. *Diagler place,* on south side of Division street, east of Lee place. Privy and cesspool about 250 feet from collecting reservoir and springs.

5. *Steinbrenner place* on south side of Division street, east of Diagler place. Privy and cesspool about 275 feet from collecting reservoir and springs.

Inasmuch as limestone foundations are full of fissures, these places are a menace to the purity of the water supply.

Samples of water from the springs entering the reservoir and from a tap in the village were taken at the time of the inspection and sent to the State Hygienic Laboratory for chemical and bacteriological analysis. The results of this analysis together with those of other samples collected by Dr. Baker, the health officer, are given in parts per million on page 375.

When free from pollution, the water in the vicinity of Williamsville should have normally a chlorine content of about 0.2 parts per million and in the case of ground water there should be practically no nitrogenous organic matter present and the water should be practically free from bacteria and entirely so of those of the B. Coli type. The chlorine content in the accompanying table varies from 11.2 to 17.0 parts per million. While this high chlorine value may be due in part to the mineral content which occurs in ground waters in some sections in the western part of the State, it is at the same time very probable that it has been caused by pollution of the supply. The organic matter present is for a ground water exceedingly high. B Coli have been found consistently present in practically all 10 c.c. and 1 c.c. samples. The whole analysis indicates beyond a doubt that both springs entering the reservoir as well as the whole supply are polluted.

This pollution cannot be traced directly to any one particular source. The springs are located in a limestone formation which is usually full of fissures. Polluted water and sewage entering a fissure may be carried for great distances without purification. The topography at Williamsville is flat and it is possible for pollution to reach the reservoir springs from the main street of the village as well as from the privies and the cesspools located within a few hundred feet of them. Fortunately, the village has been free from typhoid fever. Should the excrement of a single person who was either afflicted with typhoid fever or who is a typhoid carrier find its way into a privy or cesspool located near a fissure in the subsurface of the rock, the chances are that the water supply would become infected and an epidemic possibly follow.

Prior to the investigation of the above supply by our engineer, samples of the water were taken and sent to the Department by the health officer. The results of this analysis are given in the appended table (page 375) and indicate pollution. At the time of the above inspection, therefore, our engineer was asked to inspect the quality of Lehn Rock Spring as a new source of supply.

This spring is located on the west side of Garrison street about three-fourths mile south of the village and has quite a large flow. It is located at the foot of a long gentle slope and in the same geological formation as the springs furnishing the present supply. An inspection of the surroundings revealed some insanitary conditions, which, however, can be removed. Across the street from the spring there is a farm house with other farm buildings. A stable with a large manure pile, a hog pen and privy are located on the slope above the spring at distances of about 150 feet, 200 feet and 250 feet, respectively. The owners of the land, however, are reported ready to sell their spring to the village and to move all the buildings to some other portion of the farm.

A bacteriological analysis of a sample taken from the spring gave nineteen bacteria per cubic centimeter and B. Coli found present in all three out of three 10 c. c. samples tested, but absent from smaller quantities. The bacterial count is low showing that the pollution of this spring is probably not serious. It appears that if the buildings on the slope above the spring are removed that a water supply of good quality can be obtained from Lehn Rock Spring.

I beg to recommend, therefore, that the attention of the village authorities be called to the contaminated and unsafe quality of the present source of supply taken from springs near Garrison and Division streets which are located in a limestone formation and are subject to pollution by privies and cesspools in the village; and that steps be taken to secure a new and unpolluted source of supply. It is possible that much of the present pollution could be largely removed but owing to the geological formation from which the present source is derived, the proximity of the springs to a growing community, and the difficulty of removing and preventing pollution from such sources, I believe it is more practicable to abandon the present springs and secure a new source of supply.

While a supply of good sanitary quality may be developed from Lehn Rock Spring if the improvements and precautions are taken as suggested above, no observations have been made as to its yield. It is also possible that some other supply of equal or better quality may be more economically developed from streams, other springs, or driven wells more favorably situated with reference to freedom from possible pollution.

Under the circumstances, therefore, it would be advisable for the Williamsville board of water commissioners to retain the services of some expert engineer on water supply to make a study of the problem and to advise them as to the best means of providing a pure and safe supply.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

Analytical Data of Water Supplies

MUNICIPALITY	County	Source	Date of collection	PHYSICAL			
				Color	Turbidity	ODOR Cold	ODOR Hot
Amsterdam	Montgomery	Tap, 12 East Main street, from Hans creek supply	4/16/08	35	7	......	......
Amsterdam	Montgomery	Tap, 12 East Main street, from Hans creek supply	6/ 5/08	50	20	......	......
Amsterdam	Montgomery	McQueen's creek	7/10/08	......	......	......	......
Amsterdam	Montgomery	Tap at 35 Division street	7/10/08	......	......	......	......
Amsterdam	Montgomery	Tap at 35 Division street	12/ 1/08	33	12	......	......
Amsterdam	Montgomery	Tap at 12 East Main street	4/19/09	22	3	......	......
Amsterdam	Montgomery	Tap at 130 East Main street	7/ 8/09	65	25	......	......
Amsterdam	Montgomery	Roger's creek, 500 feet from junction with McQueen's	11/ 5/09	......	......	......	......
Amsterdam	Montgomery	McQueen's creek, 500 feet above junction with Roger's creek	11/ 5/09	......	......	......	......
Amsterdam	Montgomery	City reservoir	11/ 5/09	25	12	......	......
Amsterdam	Montgomery	McQueen's creek	12/ 6/09	......	......	......	......
Amsterdam	Montgomery	Roger's creek	12/ 6/09	......	......	......	......
Amsterdam	Montgomery	Tap in Wilson's drug store	12/ 6/09	......	......	......	......
Amsterdam	Montgomery	Hans' creek conduit	....	......	......	......	......
Berlin	Rensselaer	Tap from public supply	8/13/09	18	3	1 m	2 m.
Berlin	Rensselaer	Hammond creek	....	......	......	......	......
Cairo	Greene	Tap from public supply	7/ 7/08	6	4	1 a.	1 v
Camden	Oneida	Tap in Maloney's drug store	9/ 4/08	Trace	1	1 a.	2 m.
Camden	Oneida	Tap in Maloney's drug store	5/15/08	2	10	1 s.	2 m.
Camden	Oneida	Tap at Whitney House	12/21/08	8	2	1 v.	2 v.
Canandaigua	Ontario	Tap in village	3/ 9/08	2	2	1 v.	2 v.
Canandaigua	Ontario	Tap in village	7/ 6/08	3	17	2 m.	2 m.
Canandaigua	Ontario	Tap in village	9/14/08	1	4	1 m.	2 m.
Canandaigua	Ontario	Tap in village	12/ 8/08	Trace	1	1 v.	2 v.
Castile	Wyoming	Tap in village	9/22/08	Trace	1	1 v.	2 m.
Cazenovia	Madison	Tap in village	6/ 4/08	Trace	4	1 a.	1 m.
Deansboro	Oneida	Tap in Hamilton House	9/ 2/08	4	5	......	......
Deansboro	Oneida	Tap in Dickinson restaurant	6/16/09	1	2	......	......
Deansboro	Oneida	Muncell Springs	7/14/09	5	100	......	......
Deansboro	Oneida	Bishop Springs	7/14/09	1	10	......	......
Deposit	Broome and Delaware	Tap in village from Butler brook supply	11/ 6/08	3	1	2 m.	2 m.
Florida	Orange	Glenmore lake	7/ 2/08	15	3	2 m.	2 m.
Haverstraw, West Haverstraw and Stony Point	Rockland	Thiell's supply	3/25/08	8	2	......	......
Haverstraw, West Haverstraw and Stony Point	Rockland	Cedar pond supply	4/26/08	15	Trace	......	......
Haverstraw, West Haverstraw and Stony Point	Rockland	Burns livery, Cedar pond supply	6/22/08	35	Trace	......	......
Haverstraw, West Haverstraw and Stony Point	Rockland	Dam above pump station, Cedar pond supply	6/29/08	10	Trace	......	......
Haverstraw, West Haverstraw and Stony Point	Rockland	Pond creek supply, tap	4/15/09	22	2	......	......
Haverstraw, West Haverstraw and Stony Point	Rockland	Mixed supply at Haverstraw	4/15/09	......	......	......	......
Margaretville	Delaware	Scott brook	6/14/08	15	1	1 m.	1 m.
Port Jervis	Orange	Reservoir No. 1	10/25/09	5	Clear	3 a.	4 f.
Port Jervis	Orange	*Neversink river	10/25/09	Trace	2	2 m.	2 m.
Port Jervis	Orange	Tap in city, Neversink supply	10/25/09	......	......	......	......
Sag Harbor	Suffolk	*Tap in village, Ligonee brook	9/23/09	25	1	2 m.	3 m.
Saugerties	Ulster	*Plattekill creek supply, tap	2/10/09	3	Trace	......	......
Saugerties	Ulster	*Plattekill creek supply, tap	10/27/09	Trace	1	......	......
Saugerties	Ulster	*Plattekill creek supply, reservoir	12/18/09	3	8	......	......
Saugerties	Ulster	West Saugerties branch of Plattekill creek	12/18/09	......	......	......	......
Saugerties	Ulster	Saxton branch of Plattekill creek	12/18/09	......	......	......	......
Saugerties	Ulster	Tap in village	12/18/09	......	......	......	......
Sidney	Delaware	Tap in Nat. Exp. Co.'s office	1/22/08	......	......	......	......
Sidney	Delaware	Tap in Hotel De Cumber	3/ 5/08	7	2	1 v.	2 m.

Analytical Data of Water Supplies — (Continued)

MUNICIPALITY	County	Source	Date of collection	PHYSICAL			
				Color	Turbidity	ODOR	
						Cold	Hot
Sidney	Delaware	Tap in drug store, 43 Main street	5/ 8/08	13	25	1 m.	1 m.
Sidney	Delaware	Filtered water, Collar brook	1/22/08	2	Trace	1 v.	2 m.
Sidney	Delaware	Raw water, Collar brook system	9/ 1/08	3	3	1 a.	3 m.
Sidney	Delaware	Filtered water, Collar brook syst.	9/ 1/08	2	0	1 a.	1 m.
Sidney	Delaware	Filtered water, Collar brook syst.	11/ 4/08	5	Trace	1 v.	2 v.
Sidney	Delaware	Filtered water, Collar brook syst.	1/13/09	5	3	1 v.	1 v.
Sidney	Delaware	Filtered water, Collar brook syst.	5/ 3/09	3	5	1 v.	1 v.
Sidney	Delaware	Filtered water, Collar brook syst.	8/13/09	......	......	......	......
Sidney	Delaware	Filtered water, Peckham brook system	11/ 4/08	7	0	1 v.	2 v.
Sidney	Delaware	Filtered water, Peckham brook system	5/ 8/09	3	6	1 v.	1 v.
Sidney	Delaware	Filtered water, Peckham brook system	1/13/09	6	Trace	1 s.	1 v.
Sidney	Delaware	Filtered water, Peckham brook system	8/13/09	23	10	3 m.	2 m.
Sidney	Delaware	Peckham brook entrance to reservoir	8/13/09	......	......	......	......
Sidney Center	Delaware	Tap, Herrick Hollow creek supply	5/ 8/08	12	15	1 s.	2 m.
Sidney Center	Delaware	Tap in Everet Hotel	8/13/09	20	15	4 m.	5 m.
South Glens Falls	Saratoga	Tap, Baker and Wetsel brooks	5/ 5/08	27	2	2 m.	2 m.
South Glens Falls	Saratoga	Baker brook	8/28/08	1	Trace	1 a.	1 m.
South Glens Falls	Saratoga	Hotel on Main street	8/28/08	......	......	......	......
South Glens Falls	Saratoga	Dr. Dolan's residence	1/ 5/09	2	Clear	1 v.	2 v.
Suffern	Rockland	Antrim lake	3/26/08	12	2	2 m	3 m.
Suffern	Rockland	Village water supply	3/26/08	......	......	......	......
Suffern	Rockland	Village water supply	6/18/08	30	3	2 m.	3 m.
Suffern	Rockland	Antrim lake	11/28/08	......	......	......	......
Suffern	Rockland	Village water supply	11/28/08	......	......	......	......
Suffern	Rockland	Antrim lake	1/ 8/09	27	3	1 v.	1 v.
Suffern	Rockland	Infiltrate through gravel	1/ 8/09	......	......	......	......
Suffern	Rockland	Tap in pumping station	......	......	......	......	......
Walden	Orange	Station No. 1	12/ 6/07	......	......	......	......
Walden	Orange	Station No. 2	12/ 6/07	......	......	......	......
Walden	Orange	Tap at Eagle Hotel	12/ 6/07	......	......	......	......
Walden	Orange	Tap, Collins' plumbing shop	4/29/08	0.0	Clear	......	......
Walden	Orange	Station No. 1	4/29/08	......	......	......	......
Walden	Orange	Tap at Eagle Hotel	4/21/09	1.0	Clear	......	......
Walden	Orange	Station No. 1	11/ 4/09	Trace	Clear	......	......
Walden	Orange	Station No. 2	11/ 4/09	......	......	......	......
Washingtonville	Orange	Village supply	7/ 1/08	9	3	2 m.	3 m.
Waterloo	Seneca	Tap at 155 Virginia street	3/18/08	......	......	......	......
Waterloo	Seneca	Tap at 155 Virginia street	4/16/08	18	22	......	......
Waterloo	Seneca	Batsford's drug store	5/18/08	9	15	......	......
Waterloo	Seneca	Tap at village	9/ 9/08	1	3	......	......
Waterloo	Seneca	Maloney Bros. grocery store	12/ 7/08	1	3	......	......
Waterloo	Seneca	Tap at 71 Main street	3/29/09	20	40	......	......
Waterloo	Seneca	Tap at 71 Main street	4/26/09	......	......	......	......
Waterloo	Seneca	Seneca lake, general supply	8/18/08	......	......	......	......
Waterloo	Seneca	Seneca lake, general supply	12/ 8/08	Trace	2	......	......
Waterloo	Seneca	Seneca lake, general supply	2/17/09	Trace	Trace	......	......
Waterloo	Seneca	Seneca lake, general supply	11/ 2/09	3	1	......	......
West Carthage	Jefferson	Cold brook	11/19/06	0.0	Clear	......	......
West Carthage	Jefferson	Village supply	11/19/08	9	Clear	......	......
West Carthage	Jefferson	Lake Pleasant	8/27/09	2	3	......	......
West Carthage	Jefferson	Otis Spring	8/27/09	......	......	......	......
White Plains	Westchester	Tap in Bolland's drug store	4/23/08	3	5	......	......
White Plains	Westchester	Tap in Roemer's drug store	6/18/08	8	4	......	......
White Plains	Westchester	Pumping station	6/26/08	5	2	......	......
White Plains	Westchester	American Express office	1/ 8/09	4	2	......	......
White Plains	Westchester	Water office	2/23/09	5	10	......	......
White Plains	Westchester	Central Hotel	4/26/09	Trace	10	......	......
Williamsville	Erie	Tap in village	6/18/09	Trace	1	......	......
Williamsville	Erie	Tap at Main and Cayuga streets.	6/20/09	......	......	......	......
Williamsville	Erie	South spring in reservoir	7/16/09	......	......	......	......
Williamsville	Erie	North spring in reservoir	7/16/09	......	......	......	......
Williamsville	Erie	South spring in reservoir	8/ 6/09	Trace	3	......	......
Williamsville	Erie	North spring in reservoir	8/ 6/09	Trace	1	......	......
Williamsville	Erie	Tap in Dr. Baker's residence	8/ 6/09	Trace	12	......	......
Williamsville	Erie	Lehn Rock spring	......	......	......	......	......

Analytical Data of Water Supplies — (Continued)

MUNICIPALITY	County	CHEMICAL (PARTS PER MILLION).								
		SOLIDS			NITROGEN AS					
		Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine
Amsterdam	Montgomery	65	25	40	.020	.140	.001	0.16	5.85	1.0
Amsterdam	Montgomery	62	28	34	.020	.176	Trace	0.06	10.50	0.50
Amsterdam	Montgomery	.....	.....	.....	.....	.....	.....	.....	.....	.....
Amsterdam	Montgomery	.....	.....	.....	.....	.....	.....	.....	.....	.....
Amsterdam	Montgomery	96	34	62	.012	.126	.001	0.10	8.20	3.00
Amsterdam	Montgomery	85	32	53	.010	.092	.002	0.30	4.40	1.50
Amsterdam	Montgomery	56	19	37	.004	.212	.002	0.04	6.90	1.37
Amsterdam	Montgomery	.....	.....	.....	.....	.....	.....	.....	.....	.....
Amsterdam	Montgomery	.....	.....	.....	.....	.....	.....	.....	.....	.....
Amsterdam	Montgomery	112	32	80	.008	.094	.002	.004	3.50	0.75
Amsterdam	Montgomery	.....	.....	.....	.....	.....	.....	.....	.....	.....
Amsterdam	Montgomery	.....	.....	.....	.....	.....	.....	.....	.....	.....
Amsterdam	Montgomery	.....	.....	.....	.....	.....	.....	.....	.....	.....
Amsterdam	Montgomery	.....	.....	.....	.....	.....	.....	.....	.....	.....
Berlin	Rensselaer	46	18	28	.008	.124	.002	0.04	4.30	0.25
Berlin	Rensselaer	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cairo	Greene	51	20	31	.014	.090	Trace	0.06	3.40	0.50
Camden	Oneida	94	22	72	.002	.026	.002	0.40	0.75	0.50
Camden	Oneida	87	24	63	.008	.092	Trace	0.60	3.10	0.25
Camden	Oneida	86	27	59	.048	.064	.001	0.50	2.15	0.50
Canandaigua	Ontario	156	44	112	.022	.102	.003	0.30	1.70	2.50
Canandaigua	Ontario	159	44	115	.014	.102	.001	0.22	3.40	2.50
Canandaigua	Ontario	156	45	111	.002	.072	.001	0.20	1.70	2.37
Canandaigua	Ontario	143	29	114	.014	.128	Trace	0.30	1.80	2.50
Castile	Wyoming	178	28	140	.002	.014	Trace	1.00	0.50	1.62
Cazenovia	Madison	193	32	161	.020	.040	Trace	0.20	1.50	1.37
Deansboro	Oneida	247	56	191	.006	.032	.004	0.60	0.85	2.00
Deansboro	Oneida	251	53	198	.004	.054	.001	1.60	0.85	2.12
Deansboro	Oneida	275	53	222	.038	.408	.008	2.20	.....	.....
Deansboro	Oneida	251	47	204	.002	.056	.002	2.20	1.40	1.87
Deposit	Broome and Delaware	32	4	28	.022	.048	.001	0.40	0.60	1.37
Florida	Orange	36	18	18	Trace	.174	Trace	Trace	4.40	1.00
Haverstraw, West Haverstraw and Stony Point	Rockland	69	20	49	.020	.270	Trace	0.14	1.20	1.50
Haverstraw, West Haverstraw and Stony Point	Rockland	41	14	27	.004	.048	Trace	0.04	2.50	1.37
Haverstraw, West Haverstraw and Stony Point	Rockland	36	10	26	.008	.052	Trace	0.06	3.40	0.87
Haverstraw, West Haverstraw and Stony Point	Rockland	60	20	40	.026	.046	.001	0.20	2.10	1.75
Haverstraw ,West Haverstraw and Stony Point	Rockland	37	15	22	.006	.108	.001	0.04	4.10	2.37
Haverstraw, West Haverstraw and Stony Point	Rockland	.....	.....	.....	.....	.....	.....	.....	.....	.....
Margaretville	Delaware	44	12	32	.004	.052	.001	0.30	1.30	1.10
Port Jervis	Orange	36	18	18	.004	.174	.002	Trace	5.20	1.25
Port Jervis	Orange	31	11	21	.002	.064	.002	Trace	1.90	1.50
Port Jervis	Orange	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sag Harbor	Suffolk	70	25	45	.008	.172	.001	0.02	3.20	9.50
Saugerties	Ulster	33	8	25	.004	.080	.001	0.10	1.20	1.50
Saugerties	Ulster	25	12	13	.008	.026	.002	0.30	0.80	1.50
Saugerties	Ulster	26	12	14	.016	.052	.002	0.10	1.00	1.25
Saugerties	Ulster	.....	.....	.....	.....	.....	.....	.....	.....	.....
Saugerties	Ulster	.....	.....	.....	.....	.....	.....	.....	.....	.....
Saugerties	Ulster	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sidney	Delaware	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sidney	Delaware	30	12	18	.020	.060	.002	0.00	1.60	0.87
Sidney	Delaware	28	9	19	.002	.054	Trace	0.06	3.65	0.25
Sidney	Delaware	28	9	19	.016	.102	Trace	0.04	1.45	0.80

Analytical Data of Water Supplies — (Continued)

MUNICIPALITY	County	CHEMICAL (PARTS PER MILLION).								
		SOLIDS			NITROGEN AS				Oxygen consumed	Chlorine
		Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates		
Sidney	Delaware	52	15	37	.066	.146	.001	0.04	2.25	1.00
Sidney	Delaware	51	12	39	.014	.038	.001	0.10	1.10	1.00
Sidney	Delaware	56	18	38	.008	.068	Trace	0.10	1.05	1.12
Sidney	Delaware	39	14	25	.016	.072	.001	0.20	2.70	0.87
Sidney	Delaware	30	12	18	.014	.060	.002	0.06	2.15	0.62
Sidney	Delaware	...	...	...	...	...	...	...	...	...
Sidney	Delaware	46	8	38	.008	.084	Trace	0.10	1.25	2.00
Sidney	Delaware	29	6	23	.006	.066	.002	0.06	2.20	0.75
Sidney	Delaware	35	10	25	.040	.090	.002	0.20	2.50	0.87
Sidney	Delaware	59	25	34	.112	.194	.002	Trace	6.60	0.25
Sidney	Delaware	...	...	...	...	...	...	...	...	...
Sidney Center	Delaware	26	10	16	.018	.060	Trace	0.12	2.90	0.37
Sidney Center	Delaware	59	28	31	.474	.640	.001	0.20	6.40	1.62
South Glens Falls	Saratoga	42	16	26	.018	.086	Trace	0.20	5.95	0.87
South Glens Falls	Saratoga	83	23	60	.002	.008	.003	1.60	0.90	1.87
South Glens Falls	Saratoga	...	...	...	...	...	...	...	...	...
South Glens Falls	Saratoga	63	13	50	.016	.028	.002	1.40	0.80	2.00
Suffern	Rockland	61	26	35	.016	.098	.001	0.06	1.96	1.87
Suffern	Rockland	...	...	...	...	...	...	...	...	...
Suffern	Rockland	87	25	62	.012	.130	Trace	0.04	5.60	2.00
Suffern	Rockland	...	...	...	...	...	...	...	...	...
Suffern	Rockland	...	...	...	...	...	...	...	...	...
Suffern	Rockland	60	19	41	.014	.144	.002	0.10	5.50	2.12
Suffern	Rockland	...	...	...	...	...	...	...	...	...
Suffern	Rockland	...	...	...	...	...	...	...	...	...
Walden	Orange	...	...	...	...	...	...	...	...	...
Walden	Orange	...	...	...	...	...	...	...	...	...
Walden	Orange	...	...	...	...	...	...	...	...	...
Walden	Orange	182	26	156	.002	.020	.002	0.40	0.40	2.00
Walden	Orange	...	...	...	...	...	...	...	...	...
Walden	Orange	271	67	204	.010	.022	.002	2.40	0.10	6.00
Walden	Orange	270	65	205	.002	.002	Trace	1.20	0.10	6.75
Walden	Orange	...	...	...	...	...	...	...	...	...
Washingtonville	Orange	58	17	41	.010	.080	.002	0.90	2.35	2.00
Waterloo	Seneca	...	...	...	...	...	...	...	...	...
Waterloo	Seneca	230	56	174	.018	.138	.003	0.30	3.50	45.00
Waterloo	Seneca	246	80	106	.020	.136	.001	0.30	3.20	48.00
Waterloo	Seneca	240	63	177	.010	.090	.011	0.30	1.35	54.00
Waterloo	Seneca	339	38	301	.038	.072	.003	0.30	1.35	52.50
Waterloo	Seneca	207	79	126	.040	.230	.005	1.00	5.35	28.00
Waterloo	Seneca	...	...	...	...	...	...	...	...	...
Waterloo	Seneca	...	...	...	...	...	...	...	...	...
Waterloo	Seneca	230	36	194	.012	.090	.001	0.30	1.70	51.50
Waterloo	Seneca	252	43	209	.044	.124	.001	0.70	1.05	45.50
Waterloo	Seneca	233	61	172	.002	.076	.001	0.00	1.34	54.00
West Carthage	Jefferson	49	35	14	.008	.006	None	0.60	1.06	0.10
West Carthage	Jefferson	43	25	18	.022	.074	.001	0.80	1.50	0.25
West Carthage	Jefferson	106	55	51	.004	.134	.001	0.02	3.60	0.75
West Carthage	Jefferson	...	...	...	...	...	...	...	...	...
White Plains	Westchester	90	23	67	.006	.034	.001	0.40	1.30	3.75
White Plains	Westchester	72	20	53	.020	.060	Trace	0.30	2.00	2.75
White Plains	Westchester	94	29	65	.006	.040	.001	0.30	2.00	3.50
White Plains	Westchester	118	29	89	.032	.110	.006	0.50	2.50	4.00
White Plains	Westchester	101	33	68	.038	.112	.004	0.50	1.85	3.75
White Plains	Westchester	122	47	75	.012	.108	.003	0.50	1.85	4.00
Williamsville	Erie	552	100	452	.002	.300	.001	0.20	0.85	11.20
Williamsville	Erie	...	...	...	...	...	...	...	...	...
Williamsville	Erie	...	...	...	...	...	...	...	...	...
Williamsville	Erie	...	...	...	...	...	...	...	...	...
Williamsville	Erie	708	96	612	.002	.036	.001	0.14	1.20	17.00
Williamsville	Erie	715	95	620	.002	.032	.001	0.10	0.90	16.50
Williamsville	Erie	708	90	618	.006	.030	.001	0.10	1.35	16.40
Williamsville	Erie	...	...	...	...	...	...	...	...	...

Analytical Data of Water Supplies — (Continued)

MUNICIPALITY	County	CHEMICAL (PARTS PER MILLION)		BACTERIOLOGICAL			
		HARDNESS		Bacteria per c. c.	B. COLI TYPE + = PRESENT — = ABSENT \ = COMPLETE TEST		
		Total	Alkalinity		10 c. c.	1 c. c.	$\frac{1}{10}$ c. c.
Amsterdam	Montgomery	40.3	......	1,100	0+5—	0+5—	....
Amsterdam	Montgomery	32.5	......	....	....	....	....
Amsterdam	Montgomery	......	......	7,100	3+0—	5+0—	....
Amsterdam	Montgomery	......	......	2,800	3+0—	5+0—	....
Amsterdam	Montgomery	50.7	......	325	2+1—	2+1—	0+3—
Amsterdam	Montgomery	42.9	34.0	1,700	0+3—	0+3—	0+3—
Amsterdam	Montgomery	18.2	14.0	3,700	3+0—	3+0—	1+2—
Amsterdam	Montgomery	......	......	1,400	3+0—	3+0—	1+2—
Amsterdam	Montgomery	......	......	1,300	3+0—	3+0—	3+0—
Amsterdam	Montgomery	48.6	44.0	....	....	....	....
Amsterdam	Montgomery	......	......	4,800	3+0—	2+1—	1+2—
Amsterdam	Montgomery	......	......	6,200	3+0—	3+0—	2+1—
Amsterdam	Montgomery	......	......	1,800	3+0—	1+2—	0+3—
Amsterdam	Montgomery	......	......	350	2+1—	1+2—	0+3—
Berlin	Rensselaer	20.8	14.0	525	3+0—	3+0—	1+2—
Berlin	Rensselaer	......	......	91,000	3+0—	3+0—	3+0—
Cairo	Greene	28.0	20.5	1,800	3+0—	3+0—	....
Camden	Oneida	67.8	55.0	210	3+0—	2+3—	0
Camden	Oneida	52.1	......	650	0+3—	0+3—	0+3—
Camden	Oneida	52.9	......	3.300	2+1—	0	0
Canandaigua	Ontario	102.2	......	400	0+3—	1+4—	....
Canandaigua	Ontario	99.3	98.0	27	0+3—	0+5—	0+3—
Canandaigua	Ontario	97.1	93.0	140	3+0—	1+4—	1+4—
Canandaigua	Ontario	111.4	......	40	1+2—	0+5—	0+3—
Castile	Wyoming	120	118.0	55	1+2—	....	....
Cazenovia	Madison	148.6	......	244	2+1—	1+4—	....
Deansboro	Oneida	203	192.0	750	3+0—	5+0—	5+0—
Deansboro	Oneida	198.6	192.5	500	3+0—	3+0—	1+2—
Deansboro	Oneida	225	221	13.500	3+0—	3+0—	3+0—
Deansboro	Oneida	194.2	192.5	25,000	3+0—	3+0—	2+1—
Deposit	Broome and Delaware	16.9	8.0	28,500	3+0—	3+0—	1+1
Florida	Orange	12.7	12.0	100	3+0—	3+0—	0
Haverstraw, West Haverstraw and Stony Point	Rockland	35.1	......	1,200	—	—	....
Haverstraw, West Haverstraw and Stony Point	Rockland	12.7	......	700	2+1—	—	—
Haverstraw, West Haverstraw and Stony Point	Rockland	18.0	......	47,500	3+0—	5+0—	3+1—
Haverstraw, West Haverstraw and Stony Point	Rockland	28.0	22.0	750	3+0—	5+0—	4+0—
Haverstraw, West Haverstraw and Stony Point	Rockland	6.3	2.0	950	+	+	—
Haverstraw, West Haverstraw and Stony Point	Rockland	......	......	800	3+0—	5+0—	1+2—
Margaretville	Delaware	31.9	23.0	800	....	5+0—	3+0—
Port Jervis	Orange	11.1	6.0	120	3+0—	1+2—	0+3—
Port Jervis	Orange	16.9	13.0	2,100	2+1—	1+2—	0+3—
Port Jervis	Orange	......	......	750	3+0—	0+3—	0+3—
Sag Harbor	Suffolk	15.6	13.5	10,600	0+3—	3+0—	2+1—
Saugerties	Ulster	4.8	......	230	3+0—	0+3—	0+3—
Saugerties	Ulster	11.1	8.0	1,000	2+0—	2+0—	1+1—
Saugerties	Ulster	3.2	2.0	2,900	3+0—	2+1—	1+2—
Saugerties	Ulster	......	......	850	2+1—	2+1—	0+3—
Saugerties	Ulster	......	......	700	3+0—	1+2—	0+3—
Saugerties	Ulster	......	......	1,000	3+0—	2+1—	0+3—
Sidney	Delaware	......	......	375	2+1—	2+1—	0+3—
Sidney	Delaware	......	......	1,500	0+3—	0+4—	....
Sidney	Delaware	11.9	6.0	3,400	3+0—	5+0—	....
Sidney	Delaware	11.9	......	450	1+2—	1+3—	0+4—
Sidney	Delaware	28.6	27.0	24,000	3+0—	5+0—	5+0—
Sidney	Delaware	28.6	27.5	100	2+1—	4+1—	4+1—
Sidney	Delaware	31.2	......	250	3+0—	2+1—	0+3—
Sidney	Delaware	11.1	......	1,700	3+0—	1+2—	1+2—
Sidney	Delaware	12.7	5.0	425	3+0—	0+3—	0+3—

Analytical Data of Water Supplies — (Concluded)

MUNICIPALITY	County	CHEMICAL (PARTS PER MILLION)		BACTERIOLOGICAL			
		HARDNESS		Bacteria per c. c.	B. COLI TYPE + = PRESENT — = ABSENT ⌉ = COMPLETE TEST		
		Total	Alkalinity		10 c. c.	1 c. c.	$\frac{1}{10}$ c. c.
Sidney	Delaware	......	......	2,100	3+0—	3+0—	3+0—
Sidney	Delaware	24 7	......	700	3+0—	2+1—	2+1—
Sidney	Delaware	6.3	6.0	275	0+3—	0+3—	0+3—
Sidney	Delaware	9.5	4.5	1,600	3+0—	0+3—	0+3—
Sidney	Delaware	27.3	26.5	370	3+0—	3+0—	3+0—
Sidney	Delaware	......	......	4,000	3+0—	3+0—	3+0—
Sidney Center	Delaware	8.7	......	3,500	3+0—	5+0—	....
Sidney Center	Delaware	26.0	25.0	187,000	3+0—	3+0—	3+0—
South Glens Falls	Saratoga	16.9	......	180	2+1—	2+3—	....
South Glens Falls	Saratoga	37.7	23.0	900	3+0—	5+0—	1+4—
South Glens Falls	Saratoga	......	......	275	3+0—	5+0—	1+4—
South Glens Falls	Saratoga	31.2	......	500	1+2—	1+2—	1+2—
Suffern	Rockland	48.6	......	9,700	3+0—	4+1—	....
Suffern	Rockland	......	......	750	1+2—	1+4—	....
Suffern	Rockland	52 1	......	1,700	3+0—	5+0—	4+1—
Suffern	Rockland	......	......	500	3+0—	5+0—	1+2—
Suffern	Rockland	......	......	650	3+0—	5+0—	1+2—
Suffern	Rockland	20.8	10.0	7,000	3+0—	3+0—	2+1—
Suffern	Rockland	......	......	9,200	3+0—	3+0—	2+1—
Suffern	Rockland	......	......	10,500	3+0—	3+0—	3+0—
Walden	Orange	......	......	45	0+3—	0+3—	....
Walden	Orange	......	......	34	0+3—	0+3—	....
Walden	Orange	......	......	65	3+0—	0+3—	....
Walden	Orange	120.0	......	6	0+3—	0+3—	0+3—
Walden	Orange	......	......	5	0+3—	0+3—	0+3—
Walden	Orange	162.8	......	82	1+2—	1+2—	0+3—
Walden	Orange	171.4	153.0	30	0+3—	0+3—	0+3—
Walden	Orange	......	......	140	0+3—	0+3—	0+3—
Washingtonville	Orange	36 4	34.5	150	3+0—	3+2—	0+4—
Waterloo	Seneca	......	......	75,000	....	4+1—	2+3—
Waterloo	Seneca	118 3	......	53,000	....	4+1—	1+4—
Waterloo	Seneca	115.6	......	45,500	3+0—	2+3—	0+3—
Waterloo	Seneca	108 6	86.0	920	2+0—	5+0—	5+0—
Waterloo	Seneca	88.6	......	1,600	3+0—	3+0—	1+2—
Waterloo	Seneca	81.4	......	....	....	....	....
Waterloo	Seneca	......	......	180,100	3+0	2+1—	0+3—
Waterloo	Seneca	......	......	36,000	3+0—	5+0—	4+1—
Waterloo	Seneca	84.3	......	35	2+1—	1+2—	0+3—
Waterloo	Seneca	115.6	......	110	3+0—	3+0—	0+3—
Waterloo	Seneca	128.6	......	850	3+0—	3+0—	2+1—
West Carthage	Jefferson	19.5	......	....	....	Neg.	Neg.
West Carthage	Jefferson	21 5	......	425	1+2—	0+3—	0+3—
West Carthage	Jefferson	55.0	51.0	300	2+1—	3+0—	1+2—
West Carthage	Jefferson	......	......	600	2+1—	1+2—	0+3—
White Plains	Westchester	55.0	42.5	1,100	—*	—*	—*
White Plains	Westchester	49.3	....	250	3+0—	3+2—	—
White Plains	Westchester	47.8	42 0	850	3+0—	5+0—	4+0—
White Plains	Westchester	60 0	......	300	+	—*	—*
White Plains	Westchester	51.4	......	250	—*	—*	—*
White Plains	Westchester	68.6	52 0	450	—*	—*	—*
Williamsville	Erie	459.0	143.0	....	....	....	....
Williamsville	Erie	......	......	180,000	3+0—	3+0—	1+2—
Williamsville	Erie	......	......	95	3+0—	1+2—	0+3—
Williamsville	Erie	......	......	13,000	3+0—	3+0—	2+7—
Williamsville	Erie	478.5	151.0	2,300	3+0—	2+1—	0+3—
Williamsville	Erie	478.5	154.0	475	3+0—	1+2—	0+3—
Williamsville	Erie	471.5	......	1,400	3+0—	3+0—	1+2—
Williamsville	Erie	......	......	19	3+0—	0+3—	0+3—

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* In cold weather the colon bacilli are atypical in their behavior and often fail to produce gas. A negative presumptive test during the winter months does not therefore prove the absence of B. Coli.

Descriptive Data of Water Supplies

MUNICIPALITY	County	Population	Source of supply	Date of inspection	Ownership of waterworks	Date of installation	Population served (per cent)
		1905					
Amsterdam.....	Montgomery..	23,943	Hans creek, supplemented by Rogers and McQueen creek supplies.	12/ 6/09	Municipal...	1882	100
Berlin..........	Rensselaer....	800	Two springs and small impounding reservoir, supplemented by supply from Hammond creek.	8/10/09	Private.....	1885	50
Cairo...........	Greene.....	*500 †1,000	Tenesticook brook.........	7/ 7/08	Private.....	1898	75
Camden........	Oneida......	2,500	Emmons brook and two springs.................	9/ 9/08	Municipal...	1886	90
Canandaigua....	Ontario.......	7,500	Canandaigua lake..........	9/ 4/08	Municipal...	1895	100
Castile..........	Wyoming.....	1,000	Springs..................	9/22/08	Municipal...	1903	80
Casenovia... ...	Madison....	*1,750 †2,500	Small stream, springs, driven, artesian wells...........	9/ 7/08	Municipal...	1890	100
Deansboro.....	Oneida.......	275	Two sets of springs........	9/ 2/08	Private.....	1896	70
Deposit.........	Broome and Delaware...	2,500	Butler brook..............	12/11/08	Private.....	1884	60
Florida.........	Orange.......	750	Glenmere lake............	7 /2/08	Private.....	1892	75
Haverstraw.....	Orange.......	6,182	Thiells supply — wells and reservoir and cedar pond creek................	....	Private.....	......	54
West Haverstraw	Rockland.....	2,348		6/29/08	....	1884	80
Stony Point.....	Rockland.....	**		....	....	......	25
							100
Margaretville....	Delaware.....	700	Scott brook..............	7/14/08	Private.....	1885	75
Port Jervis.	Orange.......	10,000	Small streams supplying 3 impounding residences...	10/20/09	Private.....	1868	80
Sag Harbor.....	Suffolk.......	3,500	Ligonee..................	9/18/09	Private.....	1888	75
Saugerties......	Ulster........	3,900	Plattekill creek............	12/18/09	Municipal...	1886	98
Sidney...... ...	Delaware.....	2,700	Peckham brook, Collar brook	8/13/09	Private.....	1889	80
Sidney Center...	Delaware.....	600	Herrick Hollow creek......	8/13/09	Private.....	1897	33
South Glens Falls	Saratoga.....	2,500	Baker and Wetzel brooks..	8/ 8/08	Municipal...	1896	70
Suffern.........	Rockland.....	3,000	Mahwah river (Antrim lake).	1/ 7/09	Municipal...	1899	75
Walden.........	Orange	4,000	Driven wells..............	11/ 4/09	Municipal...	1892	100
Washingtonville.	Orange.......	700	Stream tributary to Moodna creek................	7/ 1/08	Municipal...	1895	50
Waterloo... ...	Seneca.......	4,200	Seneca river.............	9/ 9/08	Private.....	1886	55
West Carthage...	Jefferson.....	1,600	Gold creek...............	....	Municipal. .	1805	75
White Plains....	Westchester...	11,600	Small streams impounded and wells..............	6/26/08	Municipal...	1886	90
Williamsville.. .	Erie.........	1,000	Springs..................	8/ 6/09	Municipal. .	1845	40

* Resident. † Summer. ** Resident, 2,500; 1,500 summer laborers extra in brickyard.

Descriptive Data of Water Supplies — (Continued)

MUNICIPALITY	County	Average daily consumption (gallons)	Pumps (type and make)	Total pumping capacity	Capacity of reservoirs (million gallons)
Amsterdam	Montgomery	6,000,000	....	....	1,500
Berlin	Rensselaer	80,000	....	....	1.25
					0.018
Cairo	Greene	*60,000	....	....	11.5
Camden	Oneida	170,000	....	....	3.0
Canandaigua	Ontario	1,000,000	Two 12"x12" Gould tri-plunger	†1,000,000	3 8
Castile	Wyoming	100,000	....	....	.25
Cazenovia	Madison	175,000	One 8"x10" Gould tri-plunger	....	8
Deansboro	Oneida	100,000	....	....	5
Deposit	Broome and Delaware	320,000	....	....	....
Florida	Orange	25,000	....	....	1240
Haverstraw	Orange	225,000	....	....	....
W. Haverstraw	Rockland	75,000	....	....	2.5
Stony Point	Rockland	30,000	One 10½"x18" Knowles turbine pump	1,000,000	4.0
		200,000	One 12"x20"x12"x10" Worthington	1,500,000	....
Margaretville	Delaware	50,000	....	....	.09
Port Jervis	Orange	....	....	....	73.2
Sag Harbor	Suffolk	465,000	One Worthington steam pump 10"x16"x10½"x10" duplex	750,000	....
			One Worthington steam pump 12"x7"x10"	50,000	....
Saugerties	Ulster	450,000	....	....	6
Sidney	Delaware	Not known	....	....	63.5
		Not known	....	....	11
Sidney Center	Delaware	330,000	....	....	5
So. Glens Falls	Saratoga	700,000	Two 10"x16"x8½"x"10 Worthington duplex pumps	....	1.7
Suffern	Rockland	125,000	Two 8½"x10" Rumsey triplex pumps	900,000	.27
Walden	Orange	70,000	Station No. 1 equipped with one Buffalo 14"x7½"x12" duplex pump	600,000	....
			Station No. 2, with a Buffalo 7½"x12"x7½"x12" compound duplex pump	400,000	....
Washingtonville	Orange	20,000	....	....	1
Waterloo	Seneca	330,000	Two Worthington pumps 9"x16"x10½"x10" duplex	2,000,000	....
West Carthage	Jefferson	Unknown	....	....	....
White Plains	Westchester	980,000	One triple expansion direct acting condensing duplex pump 10"x16"x25"x14"x18" and one duplex compound pump 18½"x12"x12"x10", both Worthington pumps	....	....
Williamsville	Erie	70,000	Two Snow 8"x12"x8½"x12" steam duplex pumps	750,000	....

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* Summer. † Estimated.

Descriptive Data of Water Supplies — (Concluded)

MUNICIPALITY	County	Capacity of reservoirs (number of day's supply)	Pressure (pounds per square inch)	Number of miles of mains	Number of service taps	Drainage area (square miles)	Population on drainage area	Population per square mile of drainage area	Number of cases of pollution found
Amsterdam	Montgomery	250	80-100	45	3,660	*24.65 †3.5	None 92	None 26	 9
Berlin	Rensselaer	1.56	85	1.5	66	......	......	......	......
						0.15	......	......	......
						1.5	50	30	4
Cairo	Greene	190	45	3	......	1.9	60	31.6	......
Camden	Oneida	17	65	7	450	1.5	20	13.3	......
Canandaigua	Ontario	3.8	100	25	1,487	‡90 §8 ¶85	2,500 2,500 5,000	380 312 59	....
Castile	Wyoming	2.5	80	9	210	0.94	20	21.1	......
Cazenovia	Madison	46	65	6	421	.63	......	......	4
Deansboro	Oneida	50	60	1.5	45	0.5	......	......	......
Deposit	Broome and Delaware	......	60	9	375	6	150	25	......
Florida	Orange	......	35	4	100	2	30	15	......
Haverstraw	Orange	......	100	12	700	.75	......	......	......
West Haverstraw	Rockland	8	60	4					
Stony Point	Rockland	17	100	6		19	......	......	......
Margaretville	Delaware	2	75-120	3	130	1.5	35	23.3	3
Port Jervis	Orange	......	50	22	1,696	4.37	......	......	......
Sag Harbor	Suffolk	......	50	8	350	1.5	......	......	......
Saugerties	Ulster	13	80	16	730	17	600	35	16
Sidney	Delaware	......	85	16	410	3	......	......	3
						1	......	......	......
Sidney Center	Delaware	15	72	3	40	.5	25	50	......
South Glens Falls	Saratoga	2.4	65	5	439	......	......	......	......
Suffern	Rockland	2	80	8	440	20	1,500	75	22
Walden	Orange	......	60	9	690	......	......	......	......
Washingtonville	Orange	50	75	4	75	3	50	17	3
Waterloo	Seneca	......	50	9	570	729	36,800	50	......
West Carthage	Jefferson	......	80	5	300	......	......	......	......
White Plains	Westchester	220	80	32	1,800	0.82	......	......	......
Williamsville	Erie	......	40	3	100	......	......	......	......

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* Hans Creek. † Rogers & McQueen. ‡ West 90 sq. miles. § Maple Creek 8 sq. miles.
¶ West side of lake 85 square miles.

SPECIAL INVESTIGATION OF WATER PURIFICATION PLANTS

ALBANY, N. Y., *December* 30, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to transmit herewith the report of Prof. Chamot, Special Assistant in the Engineering Division, covering an investigation of certain water purification plants in the State which forms a continuation of the investigation of such plants reported upon in the Twenty-Ninth Annual Report of this Department, Vol. II, page 320. With the completion of the investigation of the plants described in the following report there remains some six or eight plants to be inspected.

While the accompanying report must be considered as of a preliminary nature, it is believed that the information and descriptions may be of considerable interest and value to the general public and to engineers and water works officials concerned with water purification problems as well as of value and convenience to the Engineering Division in both routine and special work concerning public water supplies.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

ALBANY, N. Y., *December* 28, 1909.

MR. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— I have the honor to submit herewith the results of the further inspection of municipal water purification plants begun in the summer of 1908 and continued at intervals during the summer and fall of 1909.

The municipalities visited and whose plants are described below or whose names were on the list to be inspected and whose plants are accounted for below are:

Ardsley.
Arctic.
Binghamton.
Central Valley.
Cobleskill.
Dobbs Ferry.
East Worcester.
Elmira.
Ithaca.
Jeffersonville.
Larchmont.
Mamaroneck.
Middletown.
Mt. Vernon.
North Pelham.
North Tarrytown.
Oneonta.
Pleasantville.
Port Chester.
Rensselaerville.
Suffern.
Tarrytown.
Warwick.
Watertown.
Yonkers.

Of these municipalities no purification plants of any sort were found at Arctic, Jeffersonville and Warwick.

Systems so crude as to be treated as strainers only are in use at Central Valley, East Worcester, Rensselaerville and Suffern. Cobleskill should doubtless also be included in this list.

Port Chester is supplied by a mechanical filter installation at Greenwich, Conn., and although beyond the boundary of New York State, the plant was inspected and a brief description of its construction and management has been incorporated into the present report.

Mechanical pressure filters are in use at Larchmont, Mamaroneck, Middletown, North Tarrytown, Oneonta, Port Chester (i. e., Greenwich, Conn.) and Tarrytown.

Mechanical gravity filters are employed at Binghamton, Elmira, Ithaca, Middletown and Watertown.

Slow sand filters are used at Mt. Vernon, North Pelham and Yonkers.

In all possible cases photographs of the plants have been obtained, showing the general arrangement or detailed structure, and are herewith submitted. Sketch plans have been drawn to scale where possible. These plans are necessarily inaccurate in many instances, since no reliable statement could be obtained in the absence of engineering plans. In such instances your inspector has been obliged to conjecture as to existing concealed structures.

In the preparation of the present report the data obtained is here arranged according to the plan followed in the 1908 report.

1. Situation and population of municipality.

2. Works. Component units. Original installation.
3. Present ownership. Cost. Source of supply and character of the raw water.
4. Type and character of purification.
5. Type of filters. Capacity, material collecting drain system. Special devices. Method of operation. Disposal of filtered water.
6. Operation, cost of maintenance.
7. Results obtained. Efficiency of purification.
8. Distributing system. Average consumption.

The same difficulty has been encountered as in 1908 in obtaining access to plans and particularly to the results of analyses. In most instances these latter documents doubtless do not now exist. In others, however, the bacterial efficiencies are not up to standard and the records, therefore, have been withheld. Attempts to obtain such analytical data by correspondence after failure to obtain it at the time of the visit to the works has resulted in but little success.

Respectfully submitted,

E. M. CHAMOT,

Special Assistant

ARDSLEY

Village. Population, 600. Southern section of Westchester county, on New York Central and Hudson River railroad. Water works system is part of that operated by The Consolidated Water Company of Suburban New York, whose power and purification plant is located at North Tarrytown. At Ardsley there is one standpipe. For details as to filters, see North Tarrytown.

BINGHAMTON

City. Population, 47,000. Situated southwest of the center of Broome county on the Susquehanna river. On the Erie, Delaware, Lackawanna and Western and Delaware and Hudson railroads.

Plant.— Pumped supply. Direct pressure. Pump house containing three pumps and four boilers. Filter house, containing twelve gravity mechanical filters, coagulation basins, clear well below the floor of plant, two centrifugal pumps with engines for raw water and one for wash water, one air compressor and engine, coagulation system, alum storage room, etc. Distributing system.

Owned and operated by the municipality. Purification plant completed in June, 1902, at a cost of $85,000 to $90,000.

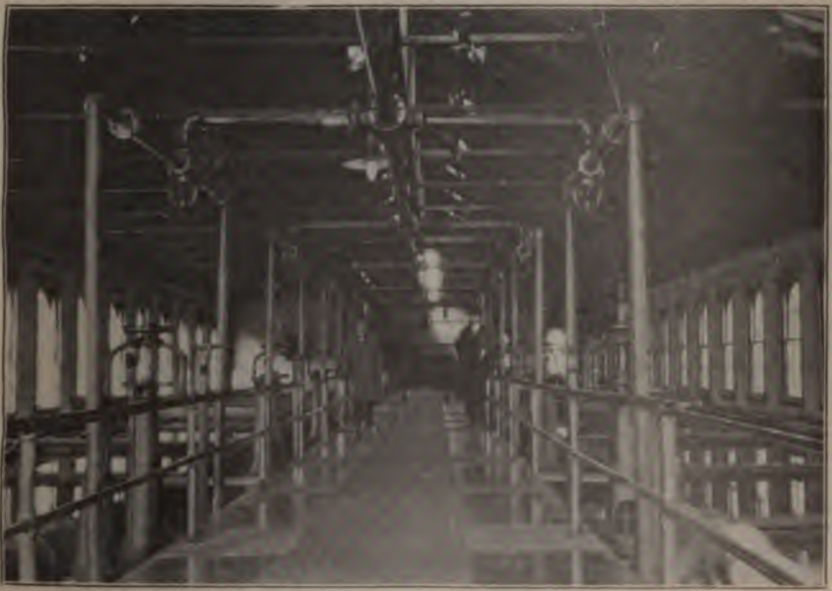
Source of Supply.— Susquehanna river with many hundred square miles of drainage area above the intake. May be considered as a polluted stream at all times. An intake well of loose masonry resting on piles has been built in mid-stream, sixteen feet in diameter, twenty-two feet deep, about twenty-four hundred feet upstream from the filter plant. A 36-inch line, whose intake end within the well is covered with gravel, extends to a "gate well" near the pumphouse and thence to the pumps.

In addition to this river water, ground water is obtained from an infiltration gallery and from a large well both adjacent to the pumphouse. From the well and gallery an amount of ground water is obtained equivalent to 5 to 12 per cent. of the total water consumed, with an average of about 8 per cent.

As will be seen from the accompanying plan the river water flows from the "gate well" to the infiltration gallery and to the "new well" so that the water taken by the centrifugal pumps for coagulation and subsequent filtration consists of mixed ground and surface water. This fact must be taken into account in order to understand the exceptionally high efficiencies claimed for the plant.

Purification Plant.— Designed by the late Professor Leeds of Stevens Institute with the co-operation of the Norwood Engineering Company and constructed by this company. The plant consists of a brick building 180 x 53 feet. At the northern end, a section 17 x 13 feet is occupied by two Lawrence centrifugal pumps each of 5,000,000 gallons capacity with 20-inch suction and 18-inch discharge having direct connected 100 h. p. 10 x 18 x 10 compound engines to run them. An equal space at the opposite side of the plant is occupied by coagulant dissolving tanks, orifice tank, etc., while the central section of 17 x 12 feet is util-

BINGHAMTON — FILTER HOUSE.



BINGHAMTON — OPERATING FLOOR.

BINGHAMTON — OVERLOOKING FILTERS.

BINGHAMTON — ONE OF THE FILTERS BEING WASHED.

BINGHAMTON — OVERLOOKING FILTERS.

BINGHAMTON — ONE OF THE FILTERS BEING WASHED.

The coagulated water enters the filters through 8-inch lines provided with ball-float valves serving to maintain the proper head on the filters and discharges through cast iron cylinders or spreaders three feet in diameter. Each filter unit has two of these inlet valves and spreaders. A head of twelve to fifteen inches is kept on the filters.

Each filter is fitted with a vacuum gauge on its effluent line to act as loss-of-head gauge.

The rate of discharge is regulated by an adjustable controller of unique construction (see plans). The effluent pipes are eight inches.

Maximum rate of filtration 12,000,000 gallons, minimum 4,000,000. Average 6,000,000.

Filters are always washed every twenty-four hours in sets of four irrespective of their loss-of-head, or more often, if necessary, because of rapid clogging. Air and water are turned on simultaneously and allowed to flow up through the bed by reversed flow until the waste flowing in the gutters is clear. The gutters are on the four bounding walls of the filter and loss of sand through simultaneous use of air and water is largely prevented by splash boards attached to the edges of the gutters. Normally ten minutes are required for the washing of each unit, but when the water is very turbid fifteen to twenty minutes may be required. Filter effluents are turned at once into the clear well without preliminary filtration to waste.

The average quantity of wash water required appears to be 4 per cent. with a maximum about 5 per cent.

Coagulation Basins.— There are two small open coagulation tanks, each 40 x 20 x 12 feet with a combined capacity of 200,000 gallons. Four baffles ten feet apart with a passage of about three feet around the ends serve to retard the flow of water and increase sedimentation. These sedimentation tanks are within the filter house and adjacent to the filters. The maximum period of detention of the coagulated water in these tanks is one and one-half hours; the minimum thirty minutes; and the average forty to fifty minutes. They are cleaned every three or four months, sometimes every month if the turbidity has been high and persistent.

BINGHAMTON — OVERLOOKING COAGULATION BASINS. FILTERS IN BACKGROUND.

BINGHAMTON — COAGULANT APPLYING DEVICE.

BINGHAMTON — CENTRIFUGAL RAW WATER PUMPS AND ENGINES.

BINGHAMTON — AIR COMPRESSORS AND ENGINE.

A force of three or four men are required to clean the tanks. Two hours are occupied in draining until only a few inches of water remain above the sludge. The men are then sent in to stir and mix up the sludge and water with brooms. The waste gates are then opened to their full capacity and the stirred up sludge run to the sewer, after which the tanks are flushed by means of hose.

Coagulation System.— Basic aluminum sulphate manufactured by The General Chemical Company is employed. Purchased under contract to contain 68 per cent. of aluminum sulphate. When samples are submitted, the brand having the highest basicity is chosen.

The filter alum is dissolved in cylindrical cypress tanks 9 feet by 6 feet discharging into a 2 by 1½-feet orifice tank provided with float valve inlet, and metal cock, discharge for regulating the flow to the raw water centrifugal pumps, entering the latter on the negative or suction side. The rate of application of the coagulant is known from the rate of fall of solution level in the dissolving tanks as shown by the movement of a scale attached to a float. Knowing the weight of alum dissolved, the rate fall of the level in the tank, and the rate of pumping, reference to tables gives the number of grains per gallon of filter alum being applied. The coagulant distributing system consists of one and one-fourth inch brass pipes. The dissolving tanks are mixed by stirring with compressed air once every hour.

The normal quantity of coagulant used is said to be 8-10 grain per gallon. Maximum 2 grains, and minimum ½ grain. The maximum quantity is employed in the spring and summer and the minimum in the middle of summer and in the middle of winter. The amount of coagulant to be added is determined by the appearance of samples of water taken at the last baffle in the coagulation tanks, together with the amount and character of the turbidity.

Bacteriological analyses are said to be made daily by the analyst of the plant, Burt E. Nelson. Complete sanitary analyses of raw and filtered waters are made several times each month. From the records of these analyses the following data for the years 1907, 1908 has been computed by your inspector.

TABLE I

	RAW WATER			FILTERED WATER		
	Bacteria per cc.	Number samples examined	Number samples in which B. Coli found	Bacteria per cc.	B. Coli	Per cent. bacteria removed
1907						
January	8,270	3	2	21	0	98.4
February	1,650	2	1	11	0	99.3
March	1,970	2	0	4	0	99.8
April	9,050	4	3	70	0	99.2
May	1,200	2	1	44	0	99.4
June	1,300	3	0	16	0	98.9
July	4,230	2	2	32	0	99.5
August	2,640	5	3	27	0	99.1
September	6,400	2	1	35	0	99.4
October	6,600	3	3	33	0	98.5
November	5,700	4	2	52	0	98.6
December	5,700	4	2	45	0	99.1
Average	4,560	3	2	35	0	99.0
1908						
January	1,260	3	3	16	0	98.5
February	26,190	4	1	49	0	97.5
March	10,400	4	4	135	0	98.9
April	5,030	4	4	50	0	98.3
May	6,330	3	3	46	0	98.9
June	3,500	3	3	47	0	98.0
July	11,980	5	3	132	0	98.6
August	1,650	2	1	35	0	98.1
September	1,070	3	0	30	0	98.1
October	1,900	2	0	40	0	98.8
November	600	2	0	9	0	98.4
December	595	2	0	7	0	94.6
Average	5,880	3	2	50	0	98.0

TABLE II

	TURBIDITY			ALKALINITY			COLOR		
	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
1907									
Raw water	77	500	1	60	86	21	....	....	.....
Filtered water	0	2	0	49	80	12	...	....	.....
1908									
Raw water	68	1,000	2	64	76	40	15	45	0
Filtered water	0	2	0	52	71	25	0	2	0

It should be remembered in the study of this data that the raw water is a variable mixture of surface and ground water and that the detailed analyses submitted to the writer and averaged above are such as are most favorable to the plant. Were all the bacteriological examinations made averaged the per cent. efficiency would doubtless be a trifle lower than as given. These daily analyses were, however, not available for averaging.

Operation and Maintenance.— Three engineers, three filter attendants and one chemist and analyst are employed in the purification plant. The men work in shifts of eight hours, one engineer and one filter attendant constituting one shift. Four filters are assigned to each man who alone washes them and sees that they are kept in proper condition.

The net expenses of purification and pumping the quantities of water filtered are as follows:

	Net expense.	Gallons filtered.
1897	$121,656 53	1,765,159,030
1898	65,887 16	1,875,612,074
1899	84,797 50	2,130,152,649
1900	54,438 06	2,203,495,275
1901	57,082 79	2,247,391,834
1902	110,370 11	2,228,740,454
1903	68,510 42	2,209,375,180
1904	83,474 40	2,567,507,200
1905	133,103 51	2,446,147,740
1906	78,854 13	2,405,645,384
1907	72,467 60	2,373,427,000
1908	71,611 03	2,511,511,479

The cost to purify, pumped to the city mains, pay for repairs, new buildings and extensions is stated to be approximately $38.88 per million gallons.

For the year 1907 the itemized cost of purification is stated to be as follows:

Gas, oil, light, etc	$218 24
Filter alum	2,867 80
Repairs	114 27
Sand (30 tons)	75 00
Fuel (estimated)	3,248 01
Labor	5,694 00
Analyses	600 00
	$12,817 32

Total water filtered, 2,373,427,000 gallons.

Cost purification per million gallons, $5.40.

Plant.— Gravity system, consisting of combined storage and distributing reservoir, intake gatehouse containing a small sand and gravel filter, and distribution system.

Owned and operated by the municipality. Original cost $65, 000, of which $5,000 was expended on the gatehouse and filters. Completed in 1887 by William N. Roberts, engineer. Since this date about $500 has been expended on repairs and extensions and excavating reservoir, making the total cost of the system a trifle over $65,500. Plant designed by William N. Roberts, C. E.

Source of supply.— The storage and distributing reservoir, three miles southeast of the village, consists of a partly artificial pond of twenty-eight acres surface area, averaging eleven feet deep, but having a depth of twenty-four feet at the gatehouse and intake. This pond has been formed by an earthwork dam and excavating in the bed of a small unnamed stream; diking the upper end and still further increased the capacity. The whole is lined with clay puddle protected by riprap. The capacity of the reservoir is estimated to be 113,000,000 gallons.

There are seven dwellings clustered about the upper end of the reservoir, and in addition one farmhouse, barn, etc., upon the bank of the stream directly above the reservoir. The surface waste from this farm goes directly to the pond, but that from the residences is prevented by the low diking. It is more than probable, however, that in the spring of the year at times of much snow and ice more or less polluting material must find its way to the reservoir. The existence of these sources of pollution can be regarded in no other light than an ever present menace, requiring constant vigilance on the part of the water works officials, since the distance from the source of pollution to intake is short and the protection afforded by so shallow a pond should not be rated too high.

The total catchment area is probably close to 500 acres. Only forty acres, including the reservoir area, are owned by the municipality. Outside the immediate proximity to the reservoir the catchment area is substantially free from pollution; it is only sparsely wooded. The catchment area is protected by statute, the rules having been formulated under the guidance of the State Department of Health. There is no regular or systematic inspection.

Filter.— Within the intake gatehouse at the reservoir there is a central well twenty-six feet deep, extending some two feet below the bottom of the reservoir. Six feet from the bottom a shelf of heavy wooden slats serves to support a layer of 3 to 4-inch stones above which there is a layer of about 3 feet of gravel, 2 inches to ¼-inch mesh, followed by about 6 inches of coarse sand ¼ to 1/16-inch mesh.

Above the filter are three intake pipes at different levels, while below and immediately above the mudpipe for emptying the pond, there is an emergency intake by which the water may be drawn from the pond without passage through the filter. From the upper intake a branch pipe extends downward, opening just below the filter. A branch pipe also extends from the mud pipe upward through the filter opening just above the surface of the sand, thus creating a waste. By closing the intake valves and opening that on this waste pipe, the space above the filter bed may be drained, if then the branch line on the intake be opened, water is admitted below the filter bed and rising through it carries off to the waste the material loosely deposited on the surface of the filter. Washing in this way by reversed flow is, or course, possible only when the water level in the reservoir is above the upper intake.

When practicable the filter is washed by reversed flow once a month, and three times a year it is claimed that all the gravel and sand is removed, rejected and replaced by entirely new material. To make this change requires five men about one and one-half days.

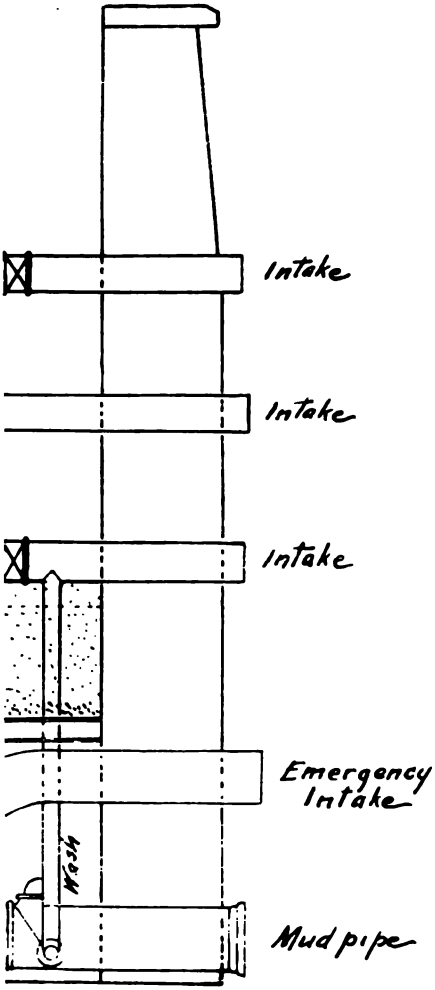
The annual cost of maintenance of entire system is $150 to $200; of the filter alone $50.

It is evident that the engineer had in mind the construction of a semi-mechanical filter. It is doubtful if much is accomplished so far as the removal of bacteria is concerned; since the available head is too low to cleanse the sand bed.

Distribution System.— Six miles of 20-inch to 4-inch cast-iron pipe; 275 service taps, mostly ⅝-inch, none of which are metered. Average pressure 82 pounds, but system capable of giving an average pressure of 107 pounds if a pressure reducing valve at gate house is not in service.

Central Valley — Charcoal Filter House.

Cobleskill.


Intake
Intake
Intake
Emergency Intake
Wash
Mudpipe

In addition to the above, three springs are piped from a small catch basin into the main to the village through a Y, a short distance below the distributing reservoir.

Purification system.— This consists of two parts, an under-drained gravel bed and a charcoal filter. The gravel filter lies about one mile in a northerly direction from the village in the bed of a small stream, fed by the storage reservoirs, in a trench through which part of the stream has been by-passed, an area about 12 feet wide by 50 feet long has been excavated to a depth of a little over 1 foot. Four lines of 4-inch tile have been laid in this excavation with loose joints fan-wise from a catch basin 6 feet by 10 feet 4 inches by 2 feet deep. Over the tile were laid stones and then creek gravel, forming a filtering layer a little less than 1 foot thick. Three sides of the catch basin are masonry and cement, the fourth is 1½-inch plank, forming an overflow weir when the water is high. The walls of the catch basin are leaky and allow as much water to enter as passes through the tile under-drains. At the opposite end of the catch basin from where the tile under-drains enter a 6-inch castiron pipe protected at the intake end by a copper strainer extends to the charcoal filter in the distributing reservoir one-fourth of a mile below.

This reservoir is 18 by 22 feet by 6 feet 3 inches deep, covered with plank and shingle roof. Its capacity is said to be only 25,000 gallons. It is situated about three-fourths of a mile from the village at the end of a small emergency reservoir about 250 feet by 140 feet by 8 to 9 feet deep. In the event of fire an automatic electric valve allows the water to enter the covered reservoir direct without passing through any filter. In one corner of the covered reservoir a pit 9 feet by 5 feet has been made with a central weir partition. The pit is filled with charcoal to a depth of 3 feet on both sides of the weir. The water thus enters, rises through the charcoal, flows over the weir, sinks through the charcoal on the other side and discharges into the reservoir through a pipe at the bottom. A 6-inch overflow extends from just above the filter to the emergency reservoir. It is thus possible to wash the charcoal filter by partial reversed flow. The charcoal is said to be renewed once a year.

Distributing system.—A few miles of 8, 6 and 4-inch castiron

East Worcester — Covered Distributing Reservoir Having a Charcoal Filtering Pit at One Corner — Emergency Reservoir.

Elmira — Filter House.

pipe. Seventy service taps, none of which are metered. Pressure on mains is 50 to 60 pounds. Actual consumption is not known, but the average stream yield is said to be in the neighborhood of 3,000,000 gallons. The Delaware & Hudson railroad is the heaviest consumer, using about 75,000 gallons daily.

Efficiency of the plant.— The gravel filter acts as a coarse strainer only when newly laid. After a short time the underdrains probably become clogged and the water enters the catch basin through the defective masonry wall. The charcoal filling in the second filter is too coarse and too small in amount to accomplish any satisfactory purification; moreover, it is not changed often enough to be of any value.

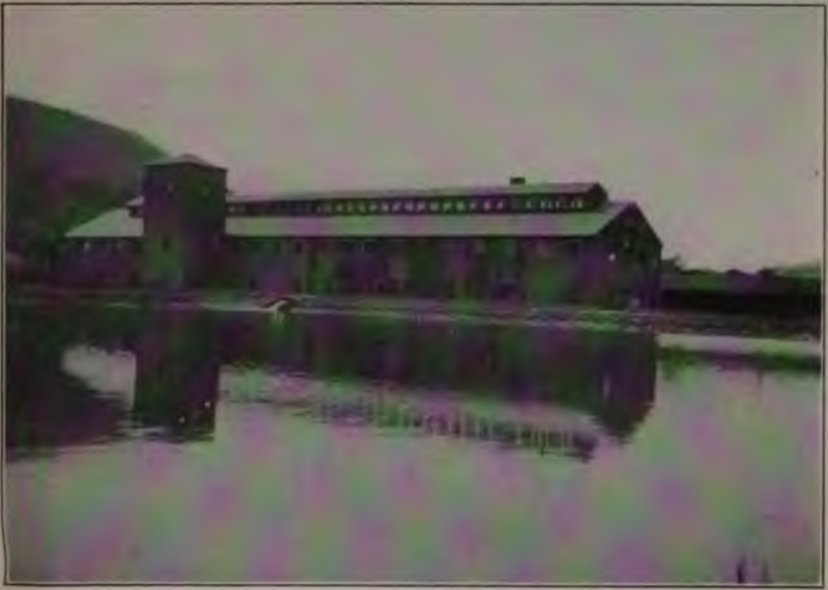
ELMIRA

City. Population, 35,000. Situated a little southwest of the center of Chemung county on the Chemung river, on the Erie, Northern Central, Lehigh Valley and Delaware, Lackawanna & Western railroads.

Plant.— Pumped system. Combined pump and filter-house containing twenty-one cypress tanks, high type, gravity mechanical filters. One Worthington duplex steam pump with high duty attachment, capacity 10,000,000 gallons, bushed to 7,000,000. One Worthington two-stage turbine pump, motor driven, direct connected with a three-phase induction motor, capacity 6,500,000. These pumps distribute filtered water. Raw water from the river pumped to filters through 8,500 feet of 20-inch pipe by second pump station. Storage reservoir of 113,000,000 gallons capacity. Distributing reservoir (clear well), 5,500,000 gallons capacity. Distributing system.

Owned and operated by Elmira Water, Light and Railroad Company.

Source of supply.— Chemung river, with a drainage area of about 2,000 square miles above the city uncontrolled, a badly polluted and frequently infected stream. The intake in the river consists of a concrete crib with an iron grating on the down-



ELMIRA — FILTER HOUSE AND OPEN CLEAR WATER RESERVOIR.
Showing coagulant tower and clear water sluice from filters.

ELMIRA — OPERATING FLOOR.

end of the cross sluice an underslot waterwheel turned by the flow of the filtered water to the reservoir furnishes power to stir the sandbeds, during washing, through mechanical rakes. As a result of washing each filter loses about four inches of sand a year.

The filters are provided with neither head, loss-of-head gauges nor rate controllers, but the rate of filtration is so regulated by a valve as to approximate an average rate equivalent to 110,000,000 to 115,000,000 gallons per acre per day, with a maximum of approximately 140,000,000 gallons per acre per day.

Under normal conditions the filters must be washed after being in service from four to twelve hours. A turbidity in the raw water of 150 permits a run of about eight hours between washings, while a turbidity of 250 reduces this period to six hours. There being no sedimentation or coagulation basin, the time of runs between washings is greatly affected by slight changes in the amount and character of turbidity. In spite of this, it is claimed that an average of only 2.5 per cent. wash water is required.

The lower compartments of the Morrison-Jewell filters acting sludge tanks are cleaned every two or three months. About eighteen inches of sludge are then found.

The three continental filters are operated substantially as described above, save that the stirring of the sand is accomplished by compressed air under two to five pounds pressure. They have no lower subsidence compartment.

Coagulation System.— Basic aluminum sulphate is employed, brand " Natrona — Pure block sulphate of alumnia " of the Pennsylvania Salt Company. The coagulant solution is prepared on the top floor of a 27 x 27 foot tower in three cylindrical cypress dissolving tanks six feet in diameter and ten feet deep, provided with a Bristol autographic water level gauge and low water electric alarm. The solution in these tanks is thoroughly mixed from time to time by compressed air. The aluminum sulphate is placed for solution in loose board boxes at the top of the tanks partially immersed in water. From the dissolving tanks, the coagulant solution flows to the orifice tank, a small wooden box 16 x 8 inches, provided with ball float inlet valve. The float of the valve is provided with wires and battery connections so arranged as to ring an electric bell alarm on the floor below in the event of the orifice tank running dry. The orifice discharges into a lead pipe entering the raw water line. It consists of a Jewell slot orifice, composed of a hard rubber disc with semi-circular slot, covered with a tightly fitted movable half disc of hard rubber attached to a spindle with brass wheelhead having a rim graduate to indicate the length of slot uncovered. The rate of discharge of the slot corresponding to divisions on the wheel having been ascertained and the strength of the coagulant solution being known, the rate of application of alum in grains per gallon is ascertained by referring to a table of calculated values.

Mixing of the coagulant solution with the raw water is effected by introducing it into the raw water line some twenty feet outside the building, the inflowing water then strikes a reducer and then two ells before reaching the main filter influent line.

On the date of inspection the specific gravity of the coagulant solution being fed was 1.043, corresponding to a solution strength of 7.8 per cent. It is stated by the superintendent that the average quantity of coagulant applied is 1½ grains per gallon with a minimum of one grain and a maximum of two grains.

The quantity of coagulant applied is determined upon by the results of the analyses of the filter effluents, the quantity being raised, it is stated, until the samples fail to disclose the presence of organisms of the B. Coli type.

At times of high turbidity it is necessary to add soda ash to provide sufficient alkalinity to the water to take care of the quantity of sulphate of aluminate required to clarify the water. Such conditions are infrequent, save at the periods of spring freshets.

Clear Well.— The metal sluice receiving the filter effluents discharges in an open reservoir with concrete bottom and rip-rap faced sides approximately 115 x 212 feet x 12 feet deep, holding 5,500,000 gallons.

Operating Expenses.— The staff consists of six men, a superintendent, who is also the analyst of the plant, two filter attendants working in twelve-hour shifts, two engineers, also working twelve-hour shifts, and one general utility man employed outside the filter house in the care of the grounds, clear well, etc.

Elmira — Clear Water Sluice to Distributing Reservoir. Water Wheel in Background.

Jeffersonville — Storage and Distributing Reservoir.

The estimated cost of purification is stated to be about ten dollars per million gallons.

Distributing System.— Pipe ranges from 20 to 1¼ inches; 5,500 service taps, 700 of which are metered. The average daily per capita consumption is about 125 gallons. The following are the total gallons of water consumed:

	Pumped.	Not pumped, but entering pipes.
1901	1,358,862,927	256,021,000
1902	1,928,352,480	180,586,850
1903	1,106,975,560	478,894,000
1904	1,095,914,100	628,509,300
1905	1,456,280,100	424,493,563

The pressure on the city mains from the gravity supply is twenty to thirty pounds, from the high service electric pumps 120 to 150 pounds.

Efficiency.— The plant is pushed to its limit and being without a coagulation basin must at times be forced beyond its safe capacity, and for the same reason the cost of purification is needlessly high. Your inspector does not believe that 2½ per cent. can possibly represent the average quantity of wash water employed if the beds are thoroughtly washed in an efficient manner, nor does he believe that the efficiency claimed, 98 per cent., fairly represents the degree of purification under the conditions which obtain. The fact that it is stated by the analyst that the quantity of coagulant is raised until B. Coli types disappear from the filter effluent is suggestive of what may happen during the adjustment of the rate of application of the coagulant solution.

Frequent examinations of the filter effluents have been made by the State Hygienic Laboratory; therefore summaries of analyses have not been here appended.

An efficiency of 98 per cent. is claimed for the plant.

It is to be regretted that the Water Works Company has not realized the importance of a coagulation basin as a protection to the consumer and as an economic factor in maintenance and operation.

ITHACA

City. Population 15,000. Situated at the center of Tompkins county on Cayuga lake. On the Lehigh Valley and Delaware, Lackawanna & Western railroads.

Plant.— Pumped supply. Three pump stations. A small emergency station at "Williams Springs," one mile southwest of the city now abandoned, formerly pumping ground water from a series of driven wells to the "Clinton street" or artesian well station containing two Worthington pumps of 400,000 gallons capacity each, now delivering artesian water to "West Hill" section of the city only. Seven flowing wells originally of 200,000 to 500,000 gallons discharge each, now greatly reduced in capacity. Van Natta Mill Pump Station, now having in service Worthington and Dean steam pumps of 2,000,000, 1,000-000 and 600,000 gallons, and three Gould high pressure fire pumps of 700,000 gallons each; these pumps may be used interchangeably to deliver either raw water or filtered water to the filter plant, to the high pressure service or to the distributing reservoirs consisting of a masonry work reservoir on "South Hill" and a steel standpipe on "East Hill." One storage reservoir. Mechanical gravity filter plant of six units with clear water basin and coagulation basin. Distributing system.

Owned and operated by the municipality.

Cost of purification plant $200,000 to $225,000.

Cost to date of water works system approximately $943,000.

Source of Supply for Purification Plant.— Six Mile creek, a small stream having a catchment area of about fifty square miles, with a population of about forty persons per square mile. An impounding reservoir has been formed in the valley of the stream by a thirty-foot reinforced concrete dam, constructed a little over a mile east of the purification plant, at a point where the stream bed forms a narrow gorge through the rocks. This dam backs up water into an amphitheater, forming a pond of some twenty acres surface area, with a capacity of approximately 72,000,000 gallons. From the bottom of this reservoir the water flows through a

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twenty-four-inch cast iron main to the Van Natta mill pump station, whence it is raised by steam or water power to the purification plant.

Six Mile creek is a torrential stream due to a runoff of exceptional rapidity; as a result, the character of the water is variable to a remarkable degree. The water is always seriously polluted after a rainstorm, even though it may be one of light rainfall and short duration. The character of the water is well shown in the following analyses. The averages of daily examinations made by the writer while in charge of the plant during the period tabulated.

TABLE I

Raw Water Analyses

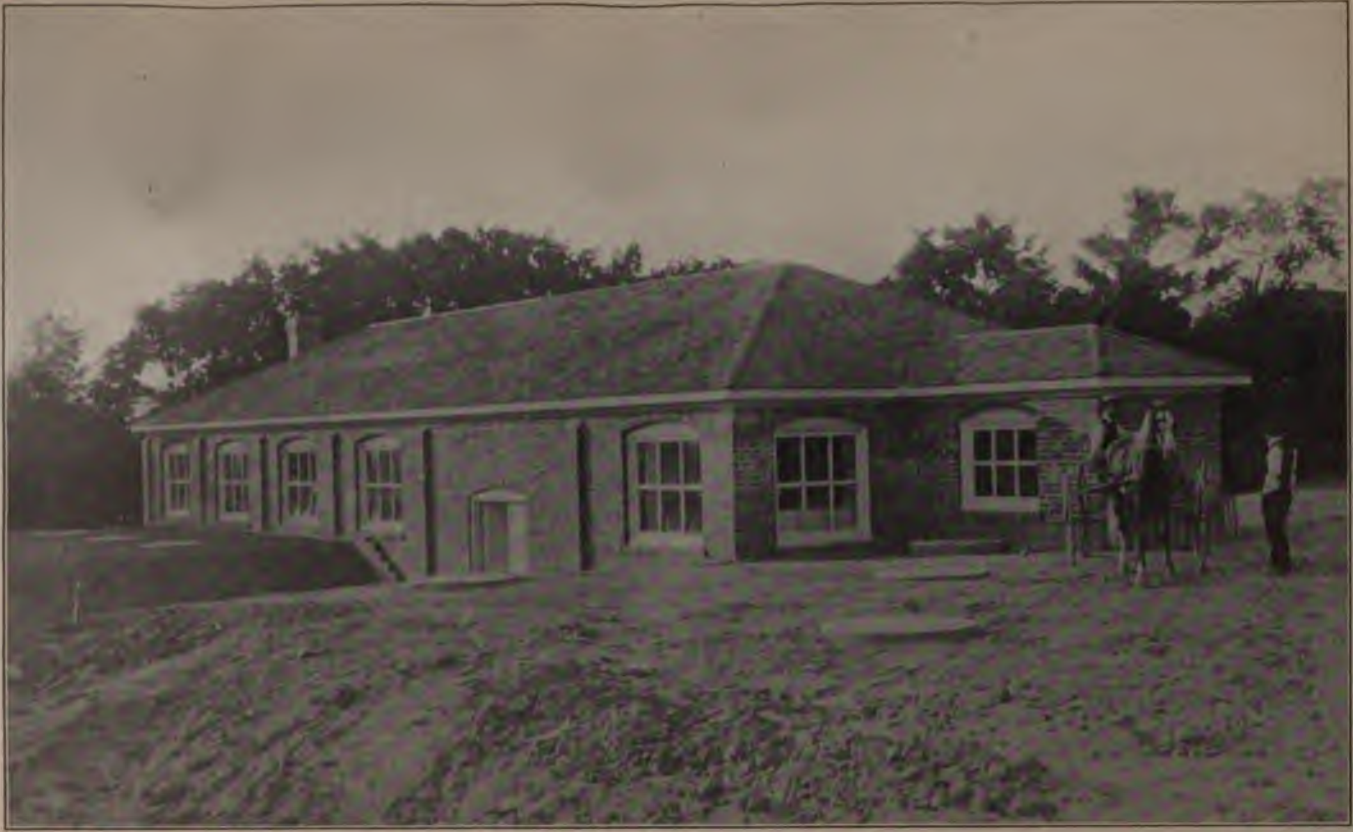
DATE	BACTERIA PER CC.			TURBIDITY		
	Average	Maximum	Minimum	Average	Maximum	Minimum
1903						
October	7,220	36,000	850	80	1,800	Trace
November	5,460	23,000	800	31	160	1
December	2,900	8,600	900	8	35	1
1904						
January	6,200	520,000	1,000	13	2,500	5
February	13,400	97,000	1,500	46	400	6
March	28,600	115,000	2,500	220	3,000	5
April	7,330	50,500	1,500	104	400	40
May	7,300	35,000	450	40	500	10
June	7,500	62,000	450	47	250	7
July	1,050	6,500	350	57	95	28
August	2,400	18,000	400	76	200	45
September	1,200	2,800	500	57	80	18
October	3,100	15,000	250	15	70	5
November	1,600	3,000	350	3	8	1
December	3,160	20,500	125	18	200	2
1905						
January	3,600	12,000	150	25	93	4
February	1,000	7,900	190	10	30	2
March	30,000	175,000	550	125	1,200	6
April	4,380	20,500	400	37	110	8
May	1,600	3,000	500	16	25	5
June	4,840	20,000	500	54	200	13
July	7,200	36,000	1,000	170	1,000	22
August	1,480	3,500	450	37	157	8
September	16,740	180,000	220	110	500	6
October	12,250	73,000	1,200	316	1,500	35
November	4,340	49,000	250	76	260	3
December	8,220	26,000	1,500	174	300	100
Average	7,150	520,000	220	72	3,000	Trace

DATE	COLOR			ALKALINITY		
	Average	Maximum	Minimum	Average	Maximum	Minimum
1903						
October	45	128	3	81	134	45
November	63	160	18	82	93	60
December	33	85	14	89	98	80
1904						
January	14	40	10	76	100	45
February	11	24	4	72	85	35
March	13	24	5	57	88	40
April	11	20	5	54	68	38
May	13	24	5	72	95	55
June	15	34	5	94	125	60
July	9	27	3	127	130	120
August	20	45	1	127	140	110
September	9	20	3	131	140	125
October	30	118	9	117	150	75
November	18	30	10	107	115	95
December	15	35	10	105	130	45
1905						
January	11	18	5	70	85	45
February	8	20	2	103	115	90
March	23	72	5	74	115	20
April	19	45	8	57	70	45
May	9	25	4	96	110	75
June	23	90	5	96	125	70
July	26	65	6	128	180	95
August	13	25	8	151	175	125
September	10	20	3	123	150	97
October	23	65	9	112	160	85
November	23	60	10	112	127	100
December	18	20	10	93	110	76
Average	20	160	1	96	180	20

During 1906–1907 a developed ground water system proved adequate for the city's needs. This ground water supply became rapidly exhausted on pumping, and the filters were placed in service at intervals during which the depressed water table was allowed to rise. Finally it was found necessary to again have recourse to filtration in 1908, and the plant has been in continuous service ever since.

The average of many chemical analyses made during a period of some ten years shows in part:

	Parts per Million.
Nitrogen as Free Ammonia	0.017
Nitrogen as Albuminoid Ammonia	0.065
Nitrogen as Nitrites	Trace
Nitrogen as Nitrates	1.170
Oxygen consumed	1.710
Chlorine	3.200



Ithaca — Exterior of Filter House — Extension of Filter at Left — Coagulation Basins in Foreground at Right.

During periods of drought or light rains the turbidity is very low, the bacterial content also low, the alkalinity relatively high and fecal and putrefactive organisms are absent and the water may be considered as potable. A moderate rain, however, gives an almost immediate surface wash of roads, dairy farms and several small villages; the turbidity rises with astonishing rapidity; usually, but curiously enough not always, accompanied by a corresponding rise in bacterial counts; fecal and putrefactive organisms appear in large numbers and the water becomes unsafe for household use. The turbidity of this stream ranges from 0 to over 4000. (silica standard), the rise and fall being almost equally rapid. Frequently, the turbidity rises from less than 100 to over 3000 in less than five hours. The maximum turbidity usually persists for a few hours only, often for one hour or even less. It then falls gradually for a few hours after which in general the fall in turbidity is very rapid.

The character of the raw water is thus gone into detail because this purification plant is called upon to handle a most interesting and difficult water problem.

The Purification Plant is the design of Engineer Allen Hazen, with the co-operation of Professor Gardner S. Williams, and further with the co-operation of the New York Continental Jewell Filtration Company of New York city. The plant consists of two covered coagulation basins below ground level arranged in parallel, each of 218,500 gallons capacity when filled to the normal flow line. Six rapid sand filters of 500,000 gallons each and a covered pure water basin below ground level.

The Coagulation Basins are of reinforced concrete, covered and placed completely under ground just east of the filter house. Each basin is 70½ x 34½ x 14 feet deep, with the flow line about 12½ feet from the bottom. The capacity is approximately 223,000 gallons when filled to the "normal" height as shown on the head gauge of the filters. A series of five board baffles arranged between the pillars supporting the arched roof serve to retard the flow of the coagulated water and to increase the deposition of sediment and sludge. As the result of experiment it has been found best to use simultaneously both basins, thus doubling the period of coagulation and subsidence. The following are the estimated subsidence periods obtained according to the number of filters in service:

	1 basin	2 basin
1 Filter	10 hours	20 hours
3 Filters	3.3 hours	6.6 hours
6 Filters	1.9 hours	3.8 hours

Under normal conditions the best results are obtained when the basins are cleaned monthly. One basin is cleaned at a time. This is done by closing the influent gate and opening the waste to sewer; after all the water has drained away, the basin is entered through one of the man or ventilator holes, and the sludge which has not flowed away is washed out by means of a fire hose. The total time occupied in cleaning a basin is about five hours.

Runs of even three months may be made with no noticeable effect on the general efficiency of the filters, providing that toward the end of the period there is no sudden change in temperature in such a direction, either up or down, as to cause an appreciable increase in the density of the entering water. If so, vertical currents result and the very fine sediment lying on the surface of the sludge at the bottom is sure to be distributed throughout the whole basin. When such conditions obtain the bacterial content of the effluent from the coagulation basins is apt to be greater than that of the raw or untreated water. This temperature effect seems to be responsible for most of the very low efficiencies of the basins and filters.

During the freshets of spring and fall the quantity of sediment removed daily by the coagulation basins is very great. It has reached as high a value as thirty-five tons, calculated as dry material. By far the greatest quantity of sediment and sludge is deposited in the first two sections of the basins, at least six to ten times as great as in the other sections. A comparison of the results of bacterial analyses of the raw and coagulated water in the appended tables will show that the coagulation basins remove from 80 to 90 per cent. of the bacteria (Table I), (Table II). Table II also gives the average period of detention in the coagulation basins. Bacterial counts are on 10 per cent, + 10 gelatine after forty-eight hours at 18° to 20°C.

TABLE II

Filter Influents

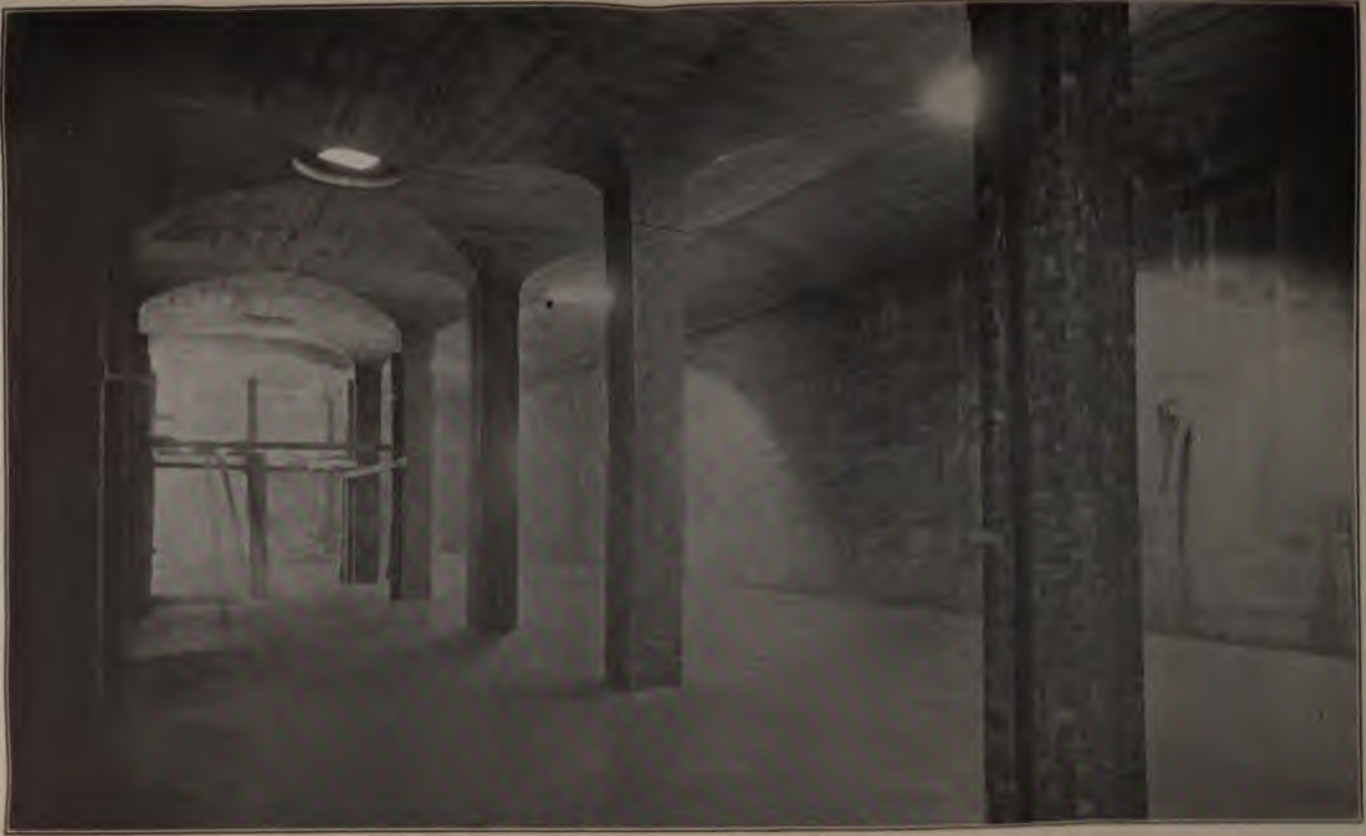
(Raw Water after Coagulation and Passage through Basins.)

	Average monthly bacteria per cubic centimeter	Average period in coagulating basin
1903		
October	680	6.1
November	960	6.5
December	870	6.2
1904		
January	1,900	6.3
February	500	5.4
March	3,300	5.4
April	690	5.1
May	1,300	6.5
June	630	6.3
July	220	6.6
August	164	6.1
September	129	6.1
October	430	6.6
November	330	6.6
December	400	6.5
1905		
January	315	....
Febuary	195	....
March	990	....
April	285	....
May	175	24
June	470	24
July	785	13.4
August	175	15.5
September	115	16.3
October	295	13.6
November	325	13.0
December	540	20.0
Average	635	....

Filters.— Six gravity units — Continental system. The filters are rectangular concrete tanks 11 x 17 feet with a sand surface 11 x 16 feet, equivalent to 0.004 acre, and having a nominal rate equivalent to 131,000,000 gallons per A. per day. The underdrains consist of a 6-inch header, sixteen feet long, tapped on each side at intervals of 6.14 inch by laterals of 1½-inch wrought-iron pipe. Each lateral carries eleven standard continental strainers, 5.7 inches center to center, with the end strainers three inches from the tank walls. Each filter therefore has 682 brass strainers. The concrete in which the under-drains are imbedded is laid up to the shoulder or flange of the strainers. Above the strainers are placed seven inches of graded gravel ranging from 1/12 inch to 1.4 inch in three layers, ¼ to ½ inch, 1/6 to ¼ inch, and the top layer, 1/6 to 1/12 inch mesh. The sand bed consists of thirty inches of sand from Felts Mills, N. Y. This sand, which has been neither sized nor screened, has an effective size of 0.39 mm., and a uniformity coefficient of 1.50. The under-drains discharge at the middle of the headers through flanged tees turned down into depressions in the floor and attached to 8-inch pipes beneath the floor to Weston controllers having a rate of 525,000 gallons per twenty-four hours. An 8-inch pipe leads from controllers to a 20-inch to the clear water basin. The controller of each filter is connected with a Jewell loss-of-head and water-level gauge each provided with electric bell and contact so arranged as to ring automatically when the loss-of-head of the filter reaches nine feet, the point set for washing the filters.

Filters are washed by reverse flow when the loss-of-head reaches nine feet. The average run will be found given in Table IV. The normal method of washing has been to turn on wash water slowly so as to lift the film deposited upon the surface of the sand and float this material off into the gutters; then to increase the wash water to its full force. As soon as the filter shows signs of clearing, the wash water is turned off and compressed air from a Root rotary blower at five pounds pressure is admitted from three to five minutes. After closing the air valve, washing with water is again practiced until the sand bed can easily be seen and the water flowing in the filter gutters is substantially clear. At the date of writing this report no air is available owing to disarrangements at the pump station, which the city has neglected to repair. The filters are now washed five to fifteen minutes by water alone.

The wash water line is taken from the pump line to the standpipe and shows a dynamic pressure of eighty to one hundred pounds. Each filter has an 8-inch influent, 8-inch effluent, 8-inch sewer, 6-inch wash water entering the 8-inch effluent line, 4-inch air and 4-inch rewash. The mains extending through the pipe gal-



ITHACA — INTERIOR COAGULATION BASIN BEFORE BAFFLES WERE INSTALLED.

ITHACA — OPERATING FLOOR IN FILTER HOUSE.

lery from which the filters take their piping are, influent 20 inch, effluent to clear well 20 inch, sewers 18-inch tile, wash water 8 inch, air 4 inch. All valves and gates are hand power.

The proper head on the filters is maintained by notifying the pumphouse in the gorge below when more or less water is required to hold the water level gauges at "normal."

Coagulation System.— Basic aluminum sulphate supplied by the General Chemical Company, having an average content of 17 per cent. water soluble alumina is employed in strengths of from 3 to 6 per cent. The dissolving tanks consist of two concrete pits 3 feet 9 inches x 8 feet 8 inches x 8 feet deep, carrying at the upper front side boxes of loose boards for holding the coagulant being dissolved by water sprayed upon it from perforated pipes. These dissolving tanks are used alternately. From the dissolving tanks the coagulant solution is raised through 1¼-inch hard rubber pipes by bronze centrifugal pumps direct connected with Pelton water motors. The pumps discharge into a two-section orifice tank with central overflow weirs permitting the overflow of the solution back to the dissolving tanks and maintaining a constant head on the Jewell orifices. The discharge orifice in each tank consists of a hard rubber plate with semi-circular slot over which tightly fits a half disk of hard rubber attached to a spindle with graduated head indicating the linear length of slot uncovered. The slots permit the coagulant solution to flow into hard rubber funnels fitted to pipes feeding into a 2-inch pipe leading to the 20-inch raw water line ending in a 3½-foot riser in a mixing chamber 10½ x 8 x 3½ feet containing five concrete baffles. The raw water, in which the coagulant is now thoroughly mixed, passes into an inlet well and thence into the coagulation basins described above through 16-inch gates. The east wall of the inlet well is sufficiently lower than the other walls as to constitute an overflow which limits the height of the water in the basins and on the filters. Table III gives the quantities of coagulant employed during the same period covered by the data given in Tables I and II.

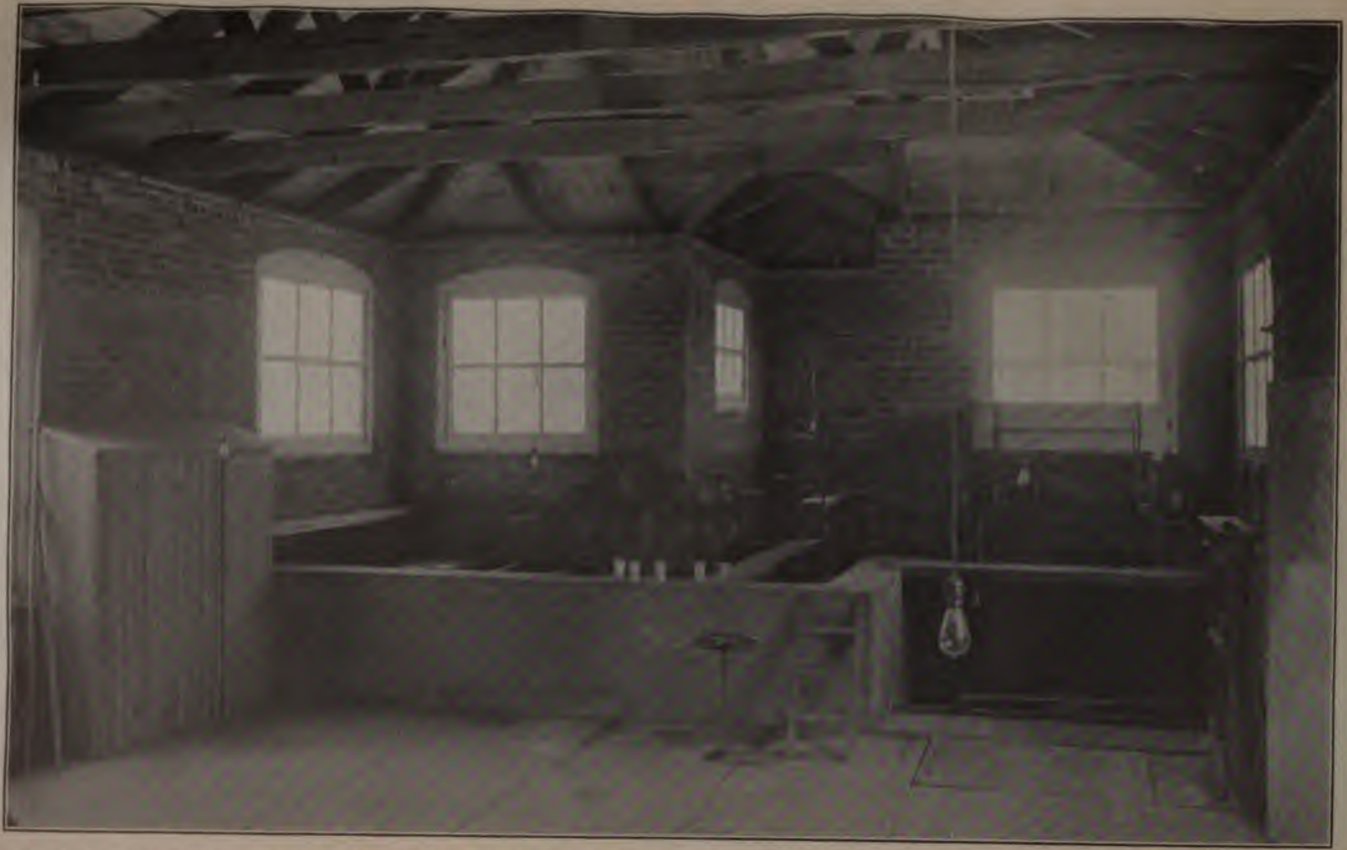
TABLE III

Grains Per Gallon Coagulent Used

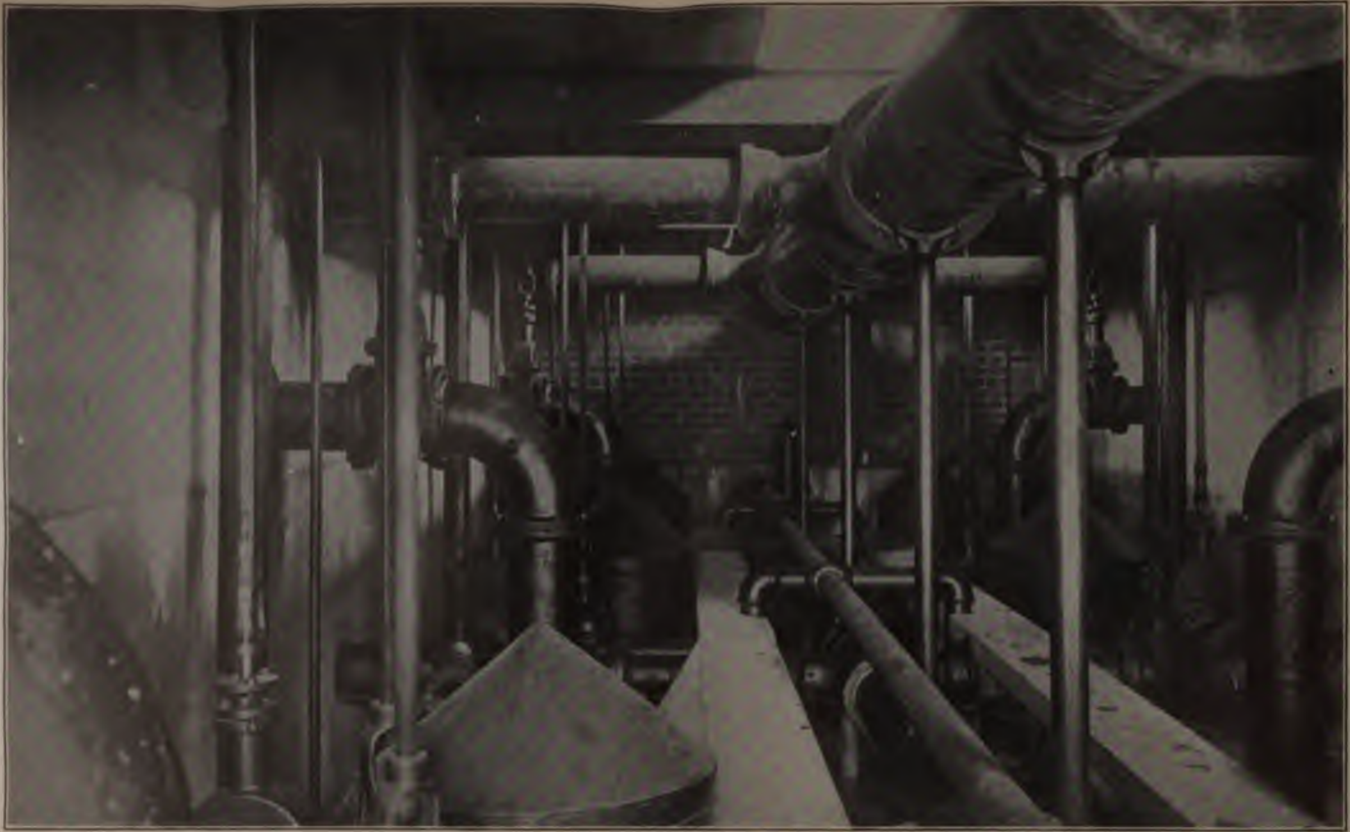
	Average	Maximum	Minimum
1903			
October	2.20	8.0	1.00
November	1.60	4.5	0.90
December	1.10	1.2	1.00
1904			
January	1.20	3.0	0.60
February	1.25	3.0	0.75
March	1.75	4.0	0.50
April	1.45	3.6	0.90
May	1.10	2.5	0.70
June	1.60	3.0	0.75
July	1.60	2.2	0.95
August	2.00	3.3	1.20
September	1.40	3.6	1.05
October	1.46	2.7	1.00
November	1.33	1.9	1.20
December	1.39	2.6	1.10
1905			
January	0.92	1.1	0.70
February	1.20	1.9	1.05
March	1.74	3.7	1.05
April	1.44	1.9	1.05
May	1.07	1.4	0.95
June	1.73	2.8	0.95
July	2.58	9.0	1.40
August	1.78	2.5	1.30
September	2.03	4.3	1.20
October	2.73	6.4	0.90
November	1.20	2.7	0.70
December	2.80	4.5	1.30
For 27 months	1.60	9.0	0.70

The bacterial efficiencies for this same period obtained with each individual filter, quantity of wash water required and amount of rewash and per cent. total waste will be found tabulated in detail in Table IV.

From December, 1905, to June, 1909, no records were kept and there was no supervision of the purification plant, nor were adequate analyses made. Complete records were again started in November, 1910, but the data has not yet been tabulated, the average per cent. bacterial removal for the three months, November, December, 1909, and January, 1910, as shown by 128 effluent analyses, is 95.5 as obtained from plates counted after seventy-two hours. If calculated from forty-eight hour plates the efficiency will be a little over 98 per cent. The results obtained are substantially the same as those given in the tables, but with a slightly lower general bacterial efficiency owing to a general deterioration



ITHACA — RAW WATER INTAKE AND MIXING CHAMBER AT LEFT — COAGULANT SYSTEM — DISSOLVING TANKS AND ORIFICE BOX, AT RIGHT.



ITHACA — PIPE GALLERY BELOW OPERATING FLOOR.

Ithaca — Interior Clear Water Basin.

of the plant and a failure on the part of the municipal authorities to again place the air compressor in service. In the winter of 1908 uncoagulated water carrying enormous quantities of exceedingly finely-divided blue clay was admitted to the filter beds agglutinating the sand in great masses (which nothing but the most energetic air scrubbing will break up) and rendering the obtaining of satisfactory efficiencies exceedingly difficult.

Efficiency of the Plant.— Not up to the standard of its constrution at the present time. Depreciating very fast and in sad need of general overhauling. The municipality is now considering the advisability of developing a new system such as to insure a sufficient supply of water for some years to come. Should a new system be adopted the present purification plant will probably be retained as an emergency supply. If, on the other hand, the present system is to be still further developed, it is probable that the needed repairs will be made to the purification plant.

The improvement in the health of the community due to the introduction of a clean water is well illustrated by the following statistics compiled from the record books of the city clerk of the city of Ithaca:

	Average number per year for five years, 1898–1902	Typhoid epidemic year	Average number per year for three years, 1904–1906 (Improved supply)
Total deaths from all causes	203	269	184
Deaths of infants under five years	32	32	27
Deaths from diseases which might be attributed directly or indirectly to impure water supply, i. e. typhoid, all diarrheal diseases, cholera infantum, etc	15	62	9

Operation and Maintenance of Purification Plant.— Three filter men are employed at the purification plant, working in shifts of eight hours. When the coagulation basins are cleaned or when repairs are to be made men from some of the other departments of the water works system are assigned to the filter plant for duty.

The superintendent of public works has furnished the following estimate of the approximate cost of purification:

Labor	$2,000 00
Coagulant	1,000 00
Repairs, etc.	200 00
Analyses and supervision	600 00
Heat and power	....
Total	$3,800 00

If we add to this $200 for heat and incidentals the cost of purification on the basis of a consumption of 1,500,000 to 1,600,000 gallons per day is found to be between six and eight dollars per million gallons.

Distributing System.— Forty-three miles of sixteen inch to four inch mains. Seventeen hundred service taps, of which 1,050 are metered. Pressure on mains from reservoirs and standpipe 60 to 150 pounds. Pressure on high pressure service system, dynamic from pumps, 60 to 150 pounds. Estimated average daily consumption "artesian water" to section known as West Hill, 200,000 gallons, of filtered water high service 700,000 gallons, of filtered water, low service 700,000 gallons.

TABLE No. IV
MONTHLY AVERAGES FOR EACH FILTER

Samples taken daily except Sundays and Holidays

FILTER No.

	Average per cent bacteria removed	Average number bacteria per cc.	Average quantity water filtered daily	Average quantity wash water used	% Wash water	Average quantity water for rewash	% Total waste	Hours run between washings
1903								
October	99.4	44	428.4	17.1	4.0	2.77	4.6	21.1
November	99.7	14	437.9	15.9	3.6	3.99	4.5	23.1
December	98.4	33	442.6	15.4	3.5	3.70	4.3	20.5
1904								
January	97.7	120	394.6	13.1	3.3	3.06	4.0	23.0
February	97.6	100	423.7	16.5	3.9	2.75	4.5	17.0
March	98.8	175	328.6	18.2	5.5	4.25	6.8	17.0
April	99.2	25	405.1	17.1	4.2	2.78	4.9	20.1
May	98.4	32	481.5	16.6	3.4	2.41	3.7	21.0
June	98.9	21	430.1	16.4	3.8	2.26	4.3	26.4
July	97.8	23	418.9	11.4	2.7	2.80	3.4	24.2
August	98.9	20	414.5	13.0	3.1	2.33	3.7	23.3
September	98.4	16	332.0	19.8	6.0	3.71	6.9	8.0
October	98.5	47	412.7	11.2	2.7	1.72	3.1	21.0
November	97.2	39	416.9	11.3	2.7	1.86	3.1	25.1
December	97.7	28	460.1	12.3	2.6	1.85	3.0	22.0
1905								
January	99.1	15	258.3	8.2	3.2	2.75	4.2	41.8
February	98.8	4	238.5	6.2	2.6	2.13	3.5	22.3
March	99.0	50	123.3	6.8	6.5	1.97	7.2	35.0
April	99.5	9	205.9	9.9	4.8	2.01	5.7	....
May	99.2	11	213.0	7.1	3.3	1.83	4.2	....
June	99.1	40	375.4	11.6	3.1	3.53	3.9	31.4
July	97.6	73	267.5	6.0	2.2	4.24	3.7	40.4
August	93.6	66	285.0	5.0	1.8	3.21	2.9	80.9
September	98.6	6	319.8	3.9	1.2	1.06	1.6	69.1
October	99.6	11	233.8	3.8	1.6	1.23	2.1	42.4
November	99.1	10	260.2	5.6	2.2	0.93	2.5	34.7
December	95.6	130	41.1	5.5	......	0.73	......	....
Average of monthly averages	98.4	43	......	......	3.2	......	3.9	....

FILTER No. 3

	Average per cent bacteria removed	Average number bacteria per cc.	Average quantity water filtered daily	Average quantity wash water used	% Wash water	Average quantity water for rewash	% Total waste	Hours run between washings
1903								
October	99.4	45	443.9	15.2	3.4	2.61	4.0	21.1
November	99.7	13	445.2	15.1	3.4	3.90	4.3	24.1
December	99.3	36	478.0	14.5	3.0	3.29	3.7	22.2
1904								
January	98.4	128	397.3	14.0	3.5	3.35	4.3	24.0
February	98.3	132	466.6	16.5	3.5	2.29	4.0	20.3
March	99.1	130	422.2	17.3	4.1	3.10	4.8	22.7
April	99.1	24	499.7	14.2	2.8	2.77	3.4	21.6
May	97.6	32	443.2	14.1	3.2	1.93	3.9	22.9
June	98.6	17	362.0	12.0	3.3	2.17	3.9	24.0
July	95.7	31	418.6	10.3	2.4	2.28	3.0	23.1
August	98.5	25	432.2	11.2	2.6	2.30	3.3	20.0
September	97.8	22	392.9	15.3	3.9	3.21	4.7	16.0
October	98.4	40	401.8	10.1	2.5	1.99	3.2	22.1
November	97.9	28	446.7	10.0	2.2	2.07	2.8	25.1
December	97.6	24	411.6	13.2	3.2	2.14	3.7	21.6
1905								
January	98.9	37	264.6	9.5	3.6	2.61	4.5	33.5
February	98.7	9	331.5	6.4	1.9	2.88	2.8	29.3
March	99.4	34	230.6	7.4	3.2	2.11	4.1	44.0
April	99.5	8	186.9	10.2	[illegible].4	1.98	6.5	....
May	99.1	15	189.1	7.1	3.7	1.76	4.7	....
June	99.1	46	193.0	7.7	4.0	1.83	5.1	46.7
July	97.8	43	350.6	6.7	1.9	3.99	3.0	43.2
August	98.7	17	372.8	5.6	1.5	0.55	1.6	66.3
September	99.6	3	363.5	4.2	1.2	1.42	1.5	84.6
October	99.4	12	294.4	5.2	1.8	1.09	2.1	60.4
November	98.4	16	326.7	6.0	1.8	0.95	2.1	40.6
December	99.7	21	125.7	14.0	......	0.58	......	....
Average of monthly averages	98.7	36	......	......	2.8	......	3.7	...

TABLE No. IV — (*Continued*)

	FILTER No. 5							
	Average per cent bacteria removed	Average number bacteria per cc.	Average quantity water filtered daily	Average quantity wash water used	% Wash water	Average quantity water for rewash	% Total waste	Hours run between washings
1903								
October	99.4	45	462.4	16.1	3.5	2.40	4.0	23.0
November	99.7	12	442.0	15.1	3.4	3.70	4.2	24.1
December	98.4	35	476.4	14.5	3.0	3.03	3.6	22.5
1904								
January	97.7	120	393.3	13.1	3.3	3.10	4.2	23.1
February	97.7	109	407.7	16.5	4.0	3.56	5.0	19.3
March	98.9	140	381.0	15.6	4.1	4.70	5.3	19.0
April	99.1	27	409.6	17.9	4.3	2.67	5.0	21.6
May	98.5	27	456.4	15.2	3.3	2.13	3.8	23.6
June	99.0	13	382.5	13.7	3.5	1.83	4.0	28.5
July	96.2	35	411.1	12.0	2.9	2.30	3.5	21.1
August	98.3	25	406.6	11.6	2.8	2.60	3.5	21.1
September	96.8	31	334.0	15.0	4.5	3.03	5.4	9.0
October	98.3	44	446.2	11.7	2.6	2.16	3.0	23.1
November	97.6	22	448.1	12.3	2.5	2.62	2.9	25.0
December	97.7	27	397.2	12.6	3.1	2.06	3.7	22.0
1905								
January	99.3	29	237.1	12.2	5.1	2.22	6.1	26.4
February	99.3	16	242.6	6.8	2.8	2.09	3.6	25.2
March	97.8	75	206.8	7.3	3.5	2.34	4.6	28.0
April	99.1	11	178.6	10.7	6.0	1.99	7.2	......
May	99.3	10	198.5	7.3	3.7	1.83	4.6	......
June	99.3	24	271.2	4.6	1.7	2.72	2.7	33.9
July	99.3	71	331.6	5.4	1.6	5.16	3.2	31.2
August	98.1	23	303.0	5.3	1.9	1.91	2.5	72.2
September	99.7	4	404.8	4.3	1.1	2.70	1.7	63.6
October	99.9	40	265.7	5.8	2.2	1.54	2.7	43.7
November	99.0	10	284.2	6.0	2.1	1.00	2.5	36.6
December	99.2	25	226.2	6.3	2.8	0.45	3.0	22.9
Average of monthly averages	98.6	39	......	......	3.1	......	3.9	......
	FILTER No 2.							
1903								
October	99.8	6	474.6	13.5	2.8	2.26	3.3	18.0
November	99.3	24	411.9	17.3	4.2	3.21	5.0	21.1
December	99.2	36	471.6	18.1	3.8	3.99	4.6	18.3
1904								
January	98.0	108	450.9	16.7	3.6	2.69	4.3	21.1
February	98.7	280	408.6	16.0	3.9	3.43	4.7	19.1
March	99.2	240	462.0	16.8	3.9	3.39	5.0	17.1
April	98.7	42	390.9	14.7	3.7	3.65	4.7	24.1
May	97.6	72	421.5	15.2	3.6	2.06	4.1	25.5
June	98.6	31	425.0	13.0	3.0	1.83	3.5	29.0
July	97.2	30	367.4	11.1	3.0	2.43	3.7	25.0
August	96.6	29	391.7	10.9	2.7	2.12	3.3	21.0
September	98.2	20	326.8	15.7	4.8	3.67	5.9	8.0
October	98.2	23	430.8	13.2	3.0	3.55	3.9	19.0
November	97.7	36	477.2	13.0	2.7	1.87	3.1	26.1
December	97.9	31	441.3	14.0	3.1	2.11	3.6	25.0
1905								
January	98.8	14	158.2	7.7	4.8	4.42	7.6	17.6
February	99.3	4	241.8	5.9	2.4	1.83	3.2	24.3
March	99.3	46	187.8	6.8	3.6	1.54	4.3	38.8
April	99.7	10	197.0	10.4	5.3	1.83	6.2	......
May	99.3	7	207.8	6.9	3.3	1.83	4.2	......
June	99.1	31	235.9	8.7	3.7	2.20	4.6	40.0
July	98.7	60	251.3	5.6	2.2	1.18	3.4	41.8
August	95.7	54	257.8	4.6	1.8	1.78	2.9	45.0
September	99.2	8	423.2	5.9	1.4	0.61	1.5	60.6
October	99.7	17	353.1	4.8	1.4	1.36	1.7	47.6
November	99.4	28	264.0	6.2	2.4	0.86	2.7	37.6
December	99.3	130	412.5	6.2	1.5	2.56	2.1	18.8
Average of monthly averages	98.6	......	......	......	2.5	......	3.9	......

TABLE No. IV — (*Continued*)

FILTER No. 4

	Average per cent bacteria removed	Average number bacteria per cc.	Average quantity water filtered daily	Average quantity wash water used	% Wash water	Average quantity water for rewash	% Total waste	Hours run between washings
1903								
October	99.8	8	467.4	13.4	2.8	2.36	3.3	20.1
November	99.3	29	441.4	15.6	3.5	3.28	4.3	18.1
December	99.2	35	408.6	11.7	2.8	3.52	3.7	18.1
1904								
January	98.8	86	478.2	18.5	3.9	3.10	4.5	24.0
February	97.7	240	425.9	17.1	4.0	3.59	4.8	18.0
March	99.2	100	386.7	16.0	4.1	4.53	5.3	18.0
April	98.7	43	405.7	15.3	3.7	2.42	4.3	22.0
May	98.9	72	450.5	15.2	3.3	2.23	3.8	22.1
June	98.6	28	418.8	11.7	2.8	1.98	3.3	26.1
July	96.7	27	421.4	11.5	2.7	2.68	3.3	22.1
August	97.0	28	439.6	10.1	2.3	2.39	2.9	20.0
September	97.8	21	379.0	15.7	4.1	3.37	5.2	8.0
October	98.2	26	441.4	11.1	2.5	2.96	3.2	14.1
November	98.3	25	459.8	11.8	2.6	1.88	3.0	25.1
December	97.9	26	427.5	11.3	2.6	2.01	3.1	25.5
1905								
January	98.0	35	268.8	7.8	2.9	3.01	4.0	31.6
February	99.1	5	285.8	6.7	2.2	2.95	3.3	26.2
March	99.3	42	218.0	6.8	3.1	1.66	3.9	38.6
April	99.6	10	197.9	10.4	5.4	1.83	6.2	......
May	99.3	10	196.8	7.0	3.5	1.83	4.4	......
June	98.9	24	221.4	7.8	3.5	1.84	4.3	......
July	98.6	53	245.6	8.9	3.6	1.62	4.2	35.3
August	95.9	56	331.3	7.3	2.2	1.60	2.6	69.0
September	98.6	4	291.1	3.9	1.3	1.37	1.8	51.6
October	99.4	15	279.2	3.4	1.2	2.06	2.1	48.0
November	98.5	32	298.0	5.4	1.8	1.41	2.3	44.5
December	99.5	8	257.6	9.1	3.5	0.73	3.8	15.0
Average of monthly averages	98.5	40	......	......	3.0	......	3.7	......

FILTER No. 6

	Average per cent bacteria removed	Average number bacteria per cc.	Average quantity water filtered daily	Average quantity wash water used	% Wash water	Average quantity water for rewash	% Total waste	Hours run between washings
1903								
October	99.8	8	472.5	14.6	3.1	1.96	3.5	17.1
November	99.4	25	419.7	15.6	3.7	3.02	4.4	20.1
December	98.8	46	440.0	17.0	3.8	3.91	4.7	17.2
1904								
January	97.9	109	450.5	17.0	3.7	3.19	4.4	19.0
February	97.7	150	416.9	20.6	4.9	3.59	5.8	16.0
March	98.9	133	396.4	18.1	4.0	3.96	5.1	18.6
April	99.4	44	396.7	23.8	6.0	3.14	6.7	18.1
May	98.7	67	427.2	17.5	4.1	2.52	4.7	19.5
June	98.5	25	418.4	14.2	3.4	1.96	3.9	24.7
July	96.4	35	446.7	11.9	2.6	2.84	3.2	26.9
August	97.4	21	441.7	12.7	2.8	2.64	3.4	22.0
September	98.7	11	378.0	18.6	4.9	3.33	5.8	10.0
October	98.5	22	449.6	12.4	2.7	2.70	3.3	17.0
November	98.1	32	457.0	12.7	2.8	2.06	3.2	22.0
December	97.7	29	436.2	13.8	3.1	2.05	3.6	25.0
1905								
January	98.8	40	234.5	9.7	4.1	3.35	5.6	19.5
February	99.2	5	285.8	6.7	2.3	2.10	3.0	19.0
March	98.4	75	189.2	7.1	3.7	1.54	4.5	29.4
April	99.1	11	195.0	9.6	4.9	1.83	5.8	......
May	99.5	12	199.4	7.3	3.6	1.83	4.6	......
June	99.1	25	193.9	9.3	4.8	1.84	5.3	28.0
July	98.2	87	262.1	6.4	2.4	3.29	3.6	33.4
August	96.8	38	315.3	9.6	3.0	2.12	3.7	48.5
September	99.2	4	293.9	3.9	1.3	1.50	1.9	55.3
October	98.7	40	305.8	7.6	2.4	1.19	2.8	36.7
November	98.6	15	263.0	4.7	1.8	0.94	2.1	37.8
December	98.3	25	242.8	7.3	3.0	0.91	3.3	17.3
Average of monthly averages	98.5	42	......	......	3.4	......	4.1	......

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Source of Supply.— Leikel brook, a rocky, wild, spring brook, with rapid fall, receiving much roadside and farm yard wash.

Distributing System.—One and one-half miles, eight inch, six inch, and four inch cast iron pipe, seventy-five service taps. Pressure, seventy-five pounds. No meters.

LARCHMONT

Incorporated village. Population 2,000 (?), on the southeast border of Westchester county, on the N. Y., N. H. & H. R. R.

Plant.— Gravity supply. One storage reservoir. Mechanical pressure filters, two units. Owned and operated by Larchmont Water Company. Original outlay in 1888, $225,200. Pipe line extension, etc., $33,000, 1904; filter and house, $16,700. Total cost to date about $275,000.

Source of Supply.— Across an amphitheater of a small unnamed stream a heavy masonry dam has been constructed one-fourth of a mile northwest of the filter house, forming a pond of ten to twelve acres area, and fifteen feet deep. The catchment area is about twenty to twenty-five square miles, free from any serious pollution. The stream is said to be inspected and cleaned up and underbrush along the banks cut once a year.

In the spring of the year trouble is often experienced by reason of the water having a fishy odor and taste. It is then customary to open the mud gate and flush out the pond, a procedure said to improve the quality of the water. Copper sulphate has not been used.

There are two farm houses on the immediate catchment area of the reservoir and six or eight on tributary streams.

Filters.— Two 6 x 10 vertical steel tank pressure filter units. Federal system, of the standard construction of this company. A single six-inch header entering the tank to carry laterals and strainers. Over the strainers there is six inches of quartz gravel, then sand sixteen to thirty-two inch mesh, and coke to the top of the vertical wall of the tank. Influent and effluent pipes, twelve inches. No clear well, filters discharge directly to mains.

The raw water line is provided with a twelve inch by-pass to be used to cut out the filters in the event of fire and turn the unpurified water into the village mains. This has been done only once in three years, it is claimed.

The device for feeding coagulant is the usual drum with shunt pressure circuit from the raw water, the rate of application of the chemical being regulated by the velocity of flow of the shunt circuit. "Cracked Crystallized Alum" (double alkali aluminum sulphate), manufactured by the General Chemical Company, is used. Purchased in one dozen barrel lots. The normal rate of application is such as to use three barrels every two weeks. There is no method of ascertaining and recording the rate of flow through the drum.

The filters are washed every twenty-four hours (oftener if necessary). The raw water is employed for washing. About thirty minutes are required for clearing a filter after which it is run to waste five to ten minutes, about two minutes being normally required to furnish a clean effluent.

A filter is considered as dirty and in need of washing when a loss of head of five pounds is shown on the pressure gauge on the effluent line. The filters discharge directly into the mains. There is no clear well.

The annual cost of purification is said to be substantially as follows:

Labor	$262 00
Chemicals	194 00
Interest	668 00
Laboratory	200 00
	$1,324 00

This gives the cost per million gallons as lying between five and ten dollars.

Analyses are said to be made monthly by the Lederle Laboratories, New York city, and are kept at the company's office in New York city. No records or data were available at Larchmont at the time of inspection.

LARCHMONT — STORAGE RESERVOIR AND GATE HOUSE.

LARCHMONT — FILTER HOUSE.

LARCHMONT — MECHANICAL PRESSURE FILTERS.

MAMARONECK — FILTER AND PUMP HOUSE.

Distributing System.— Several miles of twelve to four inch cast iron pipe, 400 three-fourths inch service taps, substantially all metered. Pressure on mains, twenty to forty-five pounds.

In the event of fire the filters are by-passed and raw water admitted to the mains. This procedure, it is claimed, has been resorted to but once in the last three years.

MAMARONECK

Incorporated village. Population 5,100. Situated in the southern part of Westchester county on the Mamaroneck river. On the N. Y., N. H. & H. R. R.

Plant.— Pumped system. Two pumps, two engines, three boilers, four mechanical pressure filters, one intake well, distributing system.

This plant forms part of the system operated by the New York Interurban Water Company (see Mt. Vernon).

Source of Supply.— St. Mary's lake and Mamaroneck river. Polluted by farm yard and house drainage. Bacterial contents 9,000 to 100 organisms per cubic centimeter, according to conditions, with an average probably close to 1,000 bacteria per c.c. The colon group is practically always present.

Trouble from bad odors and tastes is experienced spring and fall. When trouble is experienced at the Mamaroneck plant, the Mt. Vernon supply is depended upon to furnish water to the whole system.

Pump and Filter House.—Situated one mile north of the village Total length, 180 feet, divided into three sections; filter room, pump and engine room, and boiler room. There are two 3½-million gallon Robert Wetherill & Co. plunger pumps operated by two 175 H. P. engines. The three boilers are rated at eighty H. P. each. Two are in service at a time. The pumps are worked to the full carrying capacity of the 16-inch water main leading to Mt. Vernon. Dynamic head 150 pounds.

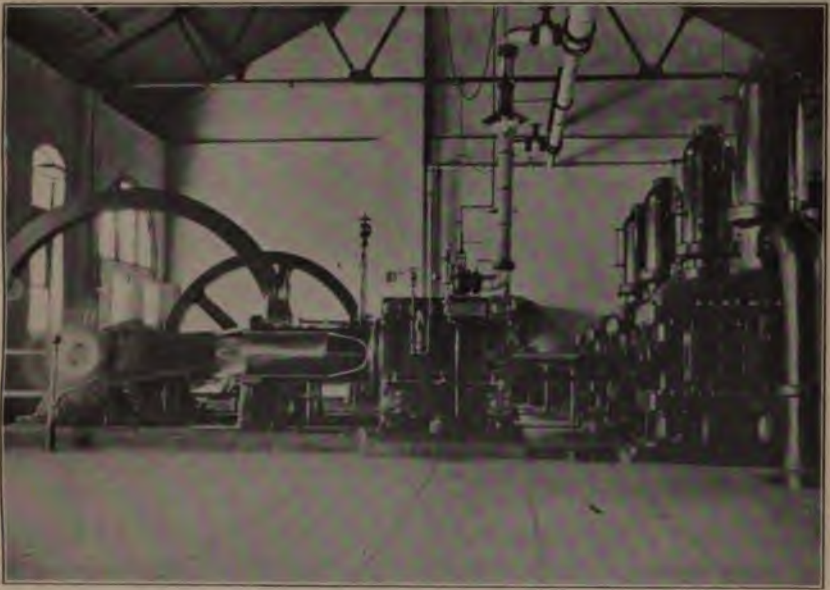
There is no storage or impounding reservoir at the works. A crude loose stone weir raises the water in the river a few inches, thus making a better flow into the circular intake well ten feet in diameter and twenty-five feet deep near the pump house.

Filters.—Four horizontal mechanical pressure filters. American Pipe and Construction Company system. The cylindrical iron tanks are 25 feet long by 8 feet high. An 18-inch layer of concrete is laid across the bottom supporting a 6-inch manifold carrying the laterals which extend parallel to the length of the tank. The laterals consist of ten rows of 2½-inch black iron pipe 10 feet 9½ inches long and ending in an elbow turned up, carrying a strainer. Each lateral carries thirty-four bronze "Pittsburg" slotted strainers, tapped to ⅜-inch, arranged in two rows, staggered, on the lower side of the pipe, 90° apart and eight inches center to center. There are 680 strainers in all. The ends of the laterals are supported upon bricks, leaving a 3½-inch space between the pipe and the surface of the concrete bottom. This strainer system was installed in May, 1908. Prior to this the laterals were perforated and covered with wire gauze. Over the strainers there is a 6-inch layer of coarse quartz gravel passing through a ¼-inch mesh, and a 3-inch layer of fine gravel passing an ⅛-inch mesh. Above the gravel there is thirty-three inches of coarse sand.

The coagulated water enters the filter-room through a 16-inch castiron pipe, reduced to twelve inches between the second and third tanks, and to a 10-inch and 8-inch between the third and fourth tanks. The tank inlets are still further reduced to six inches by reducing T's. A 6-inch T inside the tank deflects the water toward the ends.

The effluent escapes through a 6-inch opening at the center of the under side of the manifold carrying the laterals, and passes down through the floor, and to the distributing main. There is no clear water well. The rate of filtration is regulated by the rate of pumping.

The filters are washed by reverse flow, using the back pressure from the standpipe at Mt. Vernon, equivalent to approximately ninety pounds. Two tanks are washed at the same time, the pumps being slowed down so as to only just maintain pressure on the two tanks still in service. When all four tanks are in service the pressure on the influent line lies between 140 and 150 pounds,



MAMARONECK — ENGINE AND PUMP ROOM.

MAMARONECK — ENDS OF FILTER TANKS.

and on the effluent line a few pounds less. It is the custom of the filter attendant to wash when the loss of head reaches ten to twenty pounds. This point is reached after about eight hours of service unless the water is quite turbid or there is much floating algae in the river. About 6 per cent. of the wash water seems to be required for cleaning the filters. After washing, the effluent is turned at once into the mains. Filtering to waste to compact the sand and flush the underdrains is never practiced.

It is stated by the filter attendant that where the turbidity rises above thirty to forty (silica standard) the plant cannot be properly operated and that the slow sand filters at North Pelham are then depended upon to yield the entire supply of the company's system.

Coagulant.— Basic aluminum sulphate obtained from Harrison Brothers of Philadelphia is employed.

The dissolving tank consists of a cylindrical cypress tank 3 x 4 feet, with overflow about six inches from the top. The coagulant is placed in a wooden hopper supported at the middle of the tank and partly immersed in the solution. A very small stream of water trickles upon the alum in the hopper, compacting and partly dissolving it. Just outside of the dissolving tank a short galvanized iron trough feeds water through a ½-inch hard rubber pipe to the bottom of the dissolving tank. The trough is fed by a slow stream of water through a pipe with several perforations. The overflow from the tank discharges into a funnel supported by a hard rubber pipe and thence by a rubber hose to the intake or coagulating well. The rate of application of the coagulant to the raw water is controlled by the rate of flow through the dissolving tank. This is accomplished by opening or plugging more of the holes in the pipe discharging into the galvanized iron trough. The hopper is kept filled with aluminum sulphate. The superintendent of the plant believes that by this system of solution and discharge a constant and uniform application of the coagulant to the raw water is insured. No analyses or tests are available, however, to substantiate this belief. The rate of application is claimed to be 80 to 125 pounds per million gallons.

Operated as above described, the bacterial efficiency is very low, since the plant is pushed to its full capacity and at too high a rate per square foot of filter surface. In order to improve the quality of the effluent recourse has been had to chloride of lime (bleaching powder). This is dissolved in two tanks each 2 feet by 18 inches by 18 inches deep, holding thirty gallons, discharging into a small orifice tank 7 inches by 8 inches by 9 inches deep, provided with a ball float maintaining the solution at a constant level. From the orifice tank the chloride of lime solution flows to the coagulating or intake well through a rubber hose, discharging into the water six inches away from the discharge of the alum.

From the only record sheets of analyses at the plant the following averages have been calculated:

DATE	AVERAGE NUMBER BACTERIA PER C.C.		Per cent. bacteria removed	Pounds of chloride of lime used
	Raw water average	Filtered water average		
May 1– 5	775	225	70.9	3
6–10	3,335	260	22.1	3
11–15	1,030	270	73.7	3
16–19	2,300	900	60.4	3
20–26	2,490	140	90.7	14
27–30	1,245	75	93.1	31
31	1,060	16	98.5	32
June 1–4	725	35	96.2	32
5	9,300	1,400	84.9	32
6	7,000	46	99.3	37
7	760	14	96.8	32
8	550	40	92.7	10
9	650	85	86.9	0
10	1,720	750	56.3	0
11	3,000	1,020	66.0	0
12	420	80	80.9	32
13	450	18	96.0	32
14	1,570	470	70.0	33
15	5,400	55	99.0	35
16	1,145	25	97.8	41
17	550	23	95.8	35
18	550	55	90.0	32

On May 16th, 24th, 27th filtered water in *lactose litmus **bile** media* gave positive reaction for colon group.

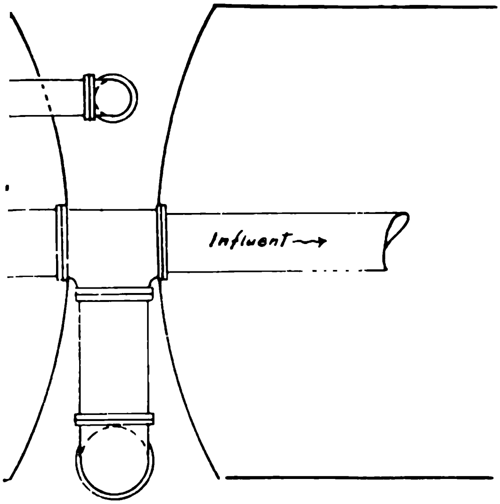
On June 14th and 17th filtered water in *lactose litmus **bile** media* gave positive reaction for colon group.

Colon group is practically constantly present in the raw water.

From the above results which are probably fairly representative, it is evident that the filter effluents are extremely variable in character and that without the use of hypochlorite the plant accomplishes very little purification. In fact, there are a number of reasons for the belief that when hypochlorite is not used there

MAMARONECK — COAGULANT DISSOLVING TANK. ORIFICE TANK AND CHLORIDE OF LIME TANK AT END OF OPERATING FLOOR.

MIDDLETOWN — RESERVOIR AND INTAKE GATE HOUSE. "MONHAGEN LAKE"— FILTER PLANT SITUATED BELOW AT LEFT.



Pressure Filters

are many times when the effluent has a higher bacterial count than the raw water.

Alkalinity of raw water thirty to fifty, alkalinity of filtered water 25 to 45. The usual difference in alkalinity between raw and filtered water is between five and eight parts per million.

Distribution System. See Mt. Vernon.

Efficiency. Low, without the use of chloride of lime the water would be many times, if not usually, unfit for household use.

MIDDLETOWN

City. Population between 14,000 and 15,000. Situated west of the center of Orange county on the Erie, and Ontario & Western railroads.

Plant.— Gravity system. Three storage reservoirs. Eight gravity mechanical filters, four pressure mechanical filters. Small clear well. Pumps for washing filters. One air compressor and filter accessories. Distributing system.

Owned and operated by municipality.

Total cost purification plant to date	$43,365 71
Total cost water works system	673,207 98

Reservoirs.— The supply for the gravity filters constituting the low pressure service is derived from two of the storage reservoirs, the upper discharging into the lower. The upper one is known as Shawangunk lake and is about three miles from the filter plant, almost four miles if measured over the pipe line, has a surface area of about 422 acres and a depth of about twenty-four feet. It is estimated to contain 417,687,000 gallons. Normally it discharges into the reservoir below, known as Monhagen lake, through a 14-inch line and ærating fountain, but may be by-passed to the filter house. Monhagen lake lies a few yards from the filters; it has a surface area of 426 acres, variable depth and an estimated capacity of 271,740,000 gallons. Shawangunk lake has an elevation of sixty feet above the filters and Monhagen lake an elevation of twenty feet. A 16-inch line leads from Monhagen lake to the filters.

The supply for the pressure filters or high service system is obtained from a third reservoir, known as Highland lake, on a different watershed. Highland lake reservoir lies about two miles from the filter house, has a surface area of approximately 341 acres and a capacity said to be 517,222,000 gallons. It lies at an elevation of eighty feet above the filters to which the water is conducted by a 12-inch line.

All of the reservoirs lie in a westerly or southwesterly direction from the filter house.

In addition to the areas of the reservoirs, the municipality owns some 240 acres of the catchment area; rents the farms thereon and carries on frequent inspection. The catchment area is protected by statutes drawn up under the advice of the State Department of Health. These are rigidly enforced even to the provision forbidding fishing in the reservoirs. The catchment area is therefore as free from pollution as it is practicable to maintain such an area.

Filters.— The filter house, situated a few yards from the foot of the embankment of Monhagen lake and two miles southwest of the city, is a brick building 38 x 130 feet with a small wing 50 x 16 feet. On one side of the building are installed the eight gravity filters, while on the opposite side are the four pressure filters, a small office, pumps and blower.

The original plant, completed in 1900, consisted of four gravity and four pressure filters. These original gravity filters are circular cypress tanks fifteen feet in diameter, eight feet deep, Federal system, each filter containing 650 Deutsch strainers and 111 separate air pipes for scrubbing. Over the strainers six inches of gravel and three feet of sand, the filters being operated under a head of thirty-one inches. A single gutter for washing extends around the inner circumference of the tanks near the top.

Shortage of water in the pressure service led to the installation of four more gravity filters. Work was begun upon them in January, 1908. They were completed and placed in commission in June, 1909. In 1908, prior to their installation, it was necessary to by-pass Monhagen lake directly to the city mains most of the year, since the four Federal system filters did not have a combined rate sufficiently high to supply the city's needs. These new filters are rectangular concrete tank Continental-Jewell filters. These

Middletown — Filter House from Reservoir Dam.

Middletown — Operating Floor Overlooking Old Filters.

tanks are 11 x 16 feet inside with 12-inch walls. A six inch header extends to the bottom, across the center, carrying thirty-three parallel rows of laterals on each side. These laterals are of one and one-half inch wrought iron pipe five feet two and three-eighths inches long, tapped for ten Continental-Jewell three-eighths strainers. With this strainer system both air and wash water may be admitted through the same header and laterals. Over these strainers there is nine inches of graded gravel in three layers and about twenty-seven inches of sand. Sand having an effective size of .46 mm. and a uniformity co-efficient of 1.5 obtained from Mt. Holly, New Jersey, is used. The filters are operated under a head of twenty-eight inches. The influent is admitted through a six-inch line ending flush with the inner wall of the filter. Over the end of the influent line a gate moves up and down actuated by a float, thus maintaining a fairly constant level on the filters. The inner longitudinal wall of the filters is lower than the outside bounding walls, so that as the filters clog, the influent overflows over all four filters. There are no controllers and no loss of head gauges. Filters are supposed to be washed when they begin to overflow. It is probable, however, that this is not strictly adhered to, since at the time of inspection all the beds were overflowing under a head of thirty-two inches. Washing is accomplished by reverse flow. After closing the influent, drawing the head on the filter to the gutters, air is forced through the sand bed after the usual custom for five minutes, then wash water for five minutes, air again for five minutes and finally wash water for ten minutes or more, if required to clean the bed. Before allowing the effluent to flow to the clear well or mains, the filters are run to waste for five minutes.

Below the filter house floor is a clear water basin 74 feet long, 36 feet wide, 6 feet deep, having a capacity of 100,000 gallons.

The gravity filters are supplied by 6-inch influents. The effluent and water lines are also six inches, sewer eight inches, filtered waste and air lines four inches. Ordinarily only six gravity filters are in service but when there is a vigorous growth of algae in the reservoir all eight filters must be placed in service because of the rapid clogging of the beds and the increased amount of wash water required to keep them cleansed. The gravity filters are operated at the rate of 416,000 gallons per day.

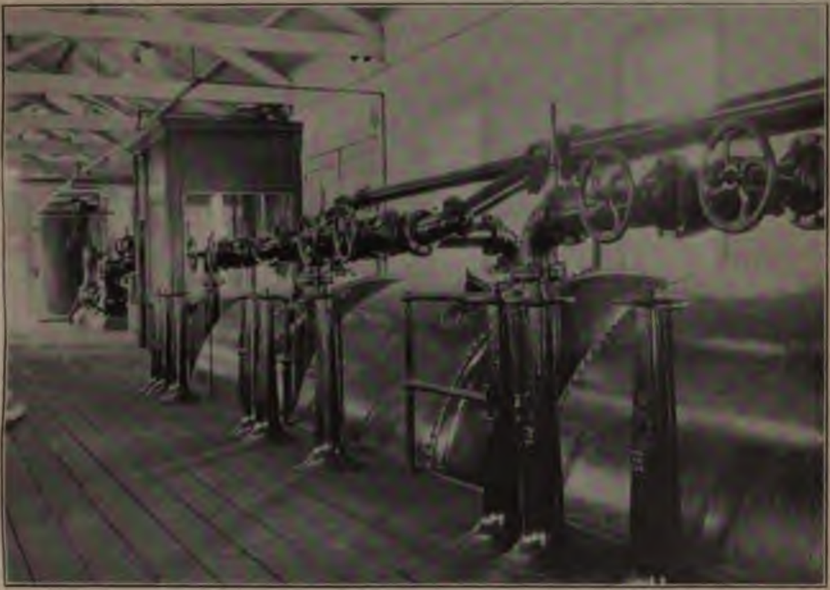
Pressure Filters.— Originally installed in 1900, there are four in number of horizontal steel tank mechanical filters furnishing the high pressure service, supplied, as stated above, by a 12-inch line from Highland lake two miles away under a head of eighty feet. These filter tanks are eight feet high by ten feet long and were originally Federal system with Deutsch strainers. In the spring of 1909 the strainers and laterals were changed, Continental strainers were then installed of the same type as in the new gravity filters. This new system of underdrains is said to consist of a single 6-inch header or manifold carrying thirty-two laterals, probably of 1½-inch wrought-iron pipe. These laterals carry 240 Continental strainers. Above the strainers there is probably six inches of gravel and twenty-four to thirty inches of sand. These filters discharge directly into the city high service mains through six inch pipes. Each filter unit has a rate of 250,000 gallons per twenty-four hours. All four are kept in service.

The influent enters the filter house through a 12-inch cast iron main, receiving a dose of coagulant shortly after entering the building and rising between the first and second tanks at the northern end of the filter house extending as twelve inches to the first tank, reduced to ten inches for the second tank, reduced to eight inches for the third tank and to six inches for the fourth tank. Each filter tank influent pipe is six inches entering at the middle of the top of the tanks. Six inch T's carry the water from these influent lines, when washing through 6-inch pipe to the sewer.

The pressure filters are washed, when the loss of head on a tank is ten pounds, by reversed flow, following substantially the same procedure as described under the gravity filters, first treating with air, then with water, with air again, and completing the wash with water until clean. Under normal conditions the filters run about twenty-four hours before showing a loss of head of ten pounds.

Air Compressor.— All the filters obtain their air for washing from a Root rotary blower No. 2, yielding a pressure on the air line of two to five pounds.

Wash Water.— All filters are washed by water down from the clear well and forced into the wash water lines by a Worthington 12 x 16 x 10, 65 horse-power steam plunger pump. A pressure of



Middletown — Operating Floor Overlooking Mechanical Pressure Filters of High Pressure Service.

Middletown — Operating Floor Overlooking New Concrete Continental Jewell Filters.

thirty pounds is maintained on the wash water line when filters are being washed.

Coagulant.— Two systems are employed, one for the high service pressure filters and another for the low service gravity filters.

The influent for the pressure filters received its coagulant by the usually employed method of a shunt current through a cast iron drum containing non-basic alum. In this case the drum is twenty-seven inches high and eighteen inches in diameter. " Pure crushed Alum " of the Pennsylvania Salt Company is employed. The rate of application is regulated by opening and closing valves on the pipes of the shunt circuit. No definite knowledge of the quantity applied being possible.

The coagulant device for the open gravity filters is placed high above the filters under the roof so as to raise the orifice tank above the level of Monhagen lake. The outlet of the orifice tank is twenty feet three inches above the floor of the filter house. A small platform supported by the rafters carries two cylindrical cypress tanks two feet ten inches in diameter and six feet deep, provided with inlet valves with glass ball floats and overflow. These storage tanks discharge into a small rectangular cypress tank 10 x 18 x 6 inches deep, provided with glass ball floats and overflow. The discharge orifice to the raw water is fitted with interchangeable calibrated ring weirs, thus enabling the filter attendants to know the exact rate of flow of the coagulant. " Natrona block pure sulphate of Alumina " of the Pennsylvania Salt Company is employed. This salt is dissolved in the wing of the filter house in a closed top cypress tank eighteen inches in diameter, and thirty-two inches high, and raised by water pressure to the storage tanks.

The usual rate of application of the coagulant to the influent of the low pressure filters is said to be from ½ to 8/10 grains, but occasionally a little over one grain per gallon has been required.

On the date of inspection of the plant, September 6, 1909, the specific gravity of the basic alum solution was 1.020, corresponding to a strength of about 3.5 per cent, and the rate of flow as measured, equivalent to 11/100 gallons per minute, a quantity which would indicate a rate of application of about 1/5 of a grain per gallon.

Operation and Maintenance.— The cost of purification for the year 1909 is stated by the superintendent to be:

Labor	$2,410 25
Coagulant	694 06
Repairs	95 78
New strainers in pressure filters	580 00
Heat, etc.	608 77
Analyses, including copper sulphate treatments	687 50
Total	$5,076 36

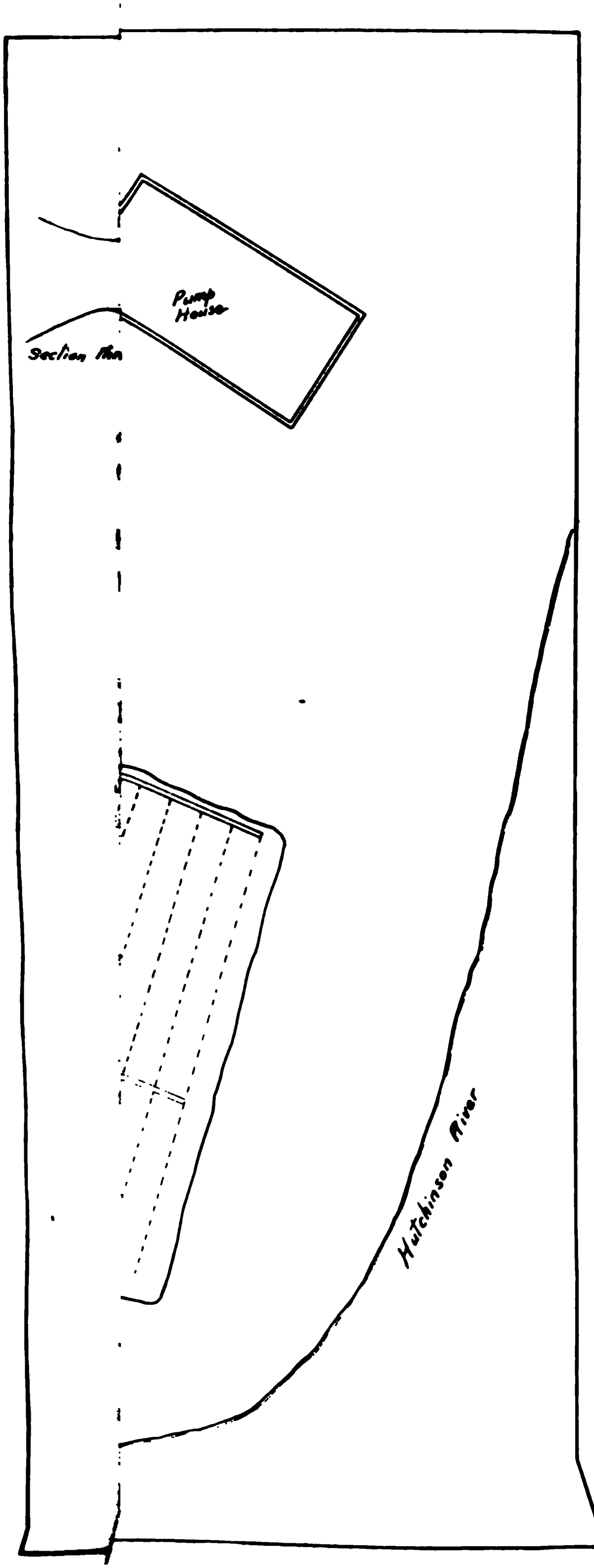
If, as stated below, the average daily consumption is 3,000,000 gallons, the cost of purification in this plant apparently lies between three and five dollars per million gallons.

Distributing System.— Forty to forty-five miles of twenty-four inch to four inch cast iron pipe. About 2,600 service taps, of which very few are metered. Pressure on mains thirty-five to eighty pounds. Average daily consumption: low pressure service, 2,500,000 gallons; high pressure service, 500,000 gallons.

Efficiency of Plant.— The superintendent writes, in reply to a request for detailed analyses — "Bacteria counts are made on the filter effluents and these counts show approximately from three to twenty bacteria per c.c. and no bacteria coli."

From the inspection of the plant, its construction and method of operation a maximum of twenty bacteria per c.c. in filter effluents is an absurdity if standard methods of examination are employed.

It is the opinion of your inspector, formed from the construction and method of operation of the plant that the bacterial efficiency is probably very satisfactory. The fact that in the low pressure purification system there is no coagulation basin and that the filters are provided with no rate controllers and function under constantly increasing heads as they clog are defects in the system rendering uniformly high efficiencies somewhat improbable. As for the high pressure filters — so few plants of this type are doing acceptable work that detailed bacterial analyses are


Pump House
Section Thru
Hutchinson River

necessary for the formation of an opinion. Thus far, your inspector has failed to find a pressure plant whose effluents are discharged directly into the distributing mains, whose bacterial efficiency is not frequently very low.

MOUNT VERNON

City. Population 27,000. Situated in the southern extremity of Westchester county on the Bronx river on the N. Y. C. & H. R. R. R.

Plant.— Pumped system. Situated at North Pelham. Consists of pump house sheltering two pumps, four storage reservoirs, three open slow sand filters, stand pipe, distributing system.

Plant is owned and operated by the New York Interurban Water Company as part of the system supplying Mt. Vernon, Mamaroneck, Harrison, Orienta and part of Rye Neck. This company is one of those controlled by the American Pipe and Construction Company of Philadelphia.

The whole system comprises about 100 miles of sixteen inch to four inch cast iron pipe.

Total cost not obtainable.

The plant at North Pelham is said by the superintendent to be now used merely as an emergency supply, the normal source of water of the system being obtained from the filters at Mamaroneck.

Sources of Supply.— The Mamaroneck and Hutchinson rivers, with four storage reservoirs. One at Pelham, 13,000,000 gallons capacity, two at New Rochelle of 80,000,000 and 5,000,000 capacity, one at Mamaroneck, 15,000,000 capacity. Supply is a polluted one with high bacterial counts and almost constant presence of fecal organisms.

The raw water flows by gravity to slow sand filters, thence to small clear well, twelve feet in diameter, whence it is pumped to a stand pipe, 120 x 20 feet.

Pumps.— One 4,000,000 gallon Worthington, one 3,000,000 gallon Dean, both compound steam pumps.

Filters.— Three open slow sand filters, J. M. Howells, engineer. These filters are nearly rectangular and have surface areas approximately 11,880 square feet, 14,150 square feet, and 16,450 square feet respectively, equivalent to 0.27 A., 0.32 A., and 0.37 A.

The underdrains consist of wooden box drains constructed of four inch by one inch planks, giving an inner space of three inches. These are set cornerwise in depressions in the bottom of the filter and surrounded by a layer of one inch to two inch mesh gravel with three layers of graded gravel above. A quarter inch opening near the bottom edge of the box allows the entry of water. The lateral underdrains extend across the filter beds parallel to each other and at right angles to a central twelve inch collecting conduit of plank. These collecting conduits extend directly to a small circular clear well twelve feet in diameter, or join a sixteen inch collecting conduit extending to the clear well. Between each row of lateral underdrains there is a rise of six inches in the bottom; the gravel above the underdrains is filled in level with the top of the rise. Over the center of this ridge there is eighteen inches of sand, while over the underdrains there is twenty-four inches of sand. The sand used is from local sand banks and passes through a one-eighth inch mesh sieve. The filters were completed in 1894 as above described, but the ridged surface has apparently not been maintained in recent years, judging from the appearance at the time of inspection.

It was formerly customary to scrape the beds about every three months. To scrape, and place again in service, the three beds requires twenty men two days. After scraping, the water is allowed to flow upon the bed from the top and not as in the best practice, filtered water admitted from the bottom. Neither are the beds first filtered to waste. Effluents are run to the clear well at once.

The rate of filtration probably lies between 2,500,000 and 3,000,000 gallons per acre per day.

In order to reduce expense and avoid the labor and annoyance of scraping, it is said to be now the practice when the beds clog to such an extent as to materially decrease their discharge to treat the beds with copper sulphate in the proportion of five

Mt. Vernon — Slow Sand Filters at North Pelham — Showing Small Clear Water Well and Gate House Just Below Pump House.

Mt. Vernon — Aerating Cascade — Slow Sand Filters and Pump House.

Mt. Vernon — Slow Sand Filters and Impounding Reservoir at North Pelham.

North Tarrytown — Reservoir.

pounds of copper sulphate to 1,000,000 gallons of water. The filtering film is thus destroyed and the rate brought back substantially to that yielded before becoming clogged. No analyses could be obtained as evidence that the copper treatment is a good and safe one to substitute for scraping. Bacteriological tests are said to be made twice a week by the Lederle laboratory of New York city. None of the reports could be examined by your inspector, nor have the promised summaries of results been forthcoming.

Distributing System.— One hundred miles of 16-inch to 4-inch castiron pipe, 6,200 service taps, all metered. Pressure on mains 30 to 125 pounds. Total consumption about 2,600,000 gallons per day. Equivalent to a daily per capita consumption of sixty-five gallons.

Efficiency.— From the appearance of the beds and a consideration of the methods of operation, it is the opinion of your inspector that high efficiencies and satisfactory effluents are doubtless the exception rather than the rule.

NORTH TARRYTOWN

Incorporated village. Population about 5,000. Western border Westchester county on Pocantico river, on the N. Y. C. & H. R. R. R.

Plant.— Pumped system. Impounding reservoir. Pump and filter house containing three boilers, two pumps and four mechanical pressure filters. Chemical house for storage and application of coagulant. Coagulating standpipe basin. Two distributing reservoirs, distributing system.

This plant is part of the system owned and operated by the Consolidated Water Company of Suburban New York, and the New York Interurban Water Company, but controlled by the American Pipe and Construction Company of Philadelphia.

North Tarrytown, Ardsley, Dobbs Ferry and Hastings are said to be supplied by this plant.

Reservoirs.— One storage or impounding reservoir on the Pocantico river fed by Lake Pocantico. Capacity 83,000,000 gallons. Total catchment area fifteen to twenty square miles, part of which is badly polluted by farm and farmhouse drainage.

Distributing reservoirs are two in number, an uncovered standpipe at Ardsley holding 4,000,000 gallons, giving a pressure of sixty pounds, and an open reservoir at North Tarrytown with a capacity of 11,000,000 gallons with 100 pounds pressure.

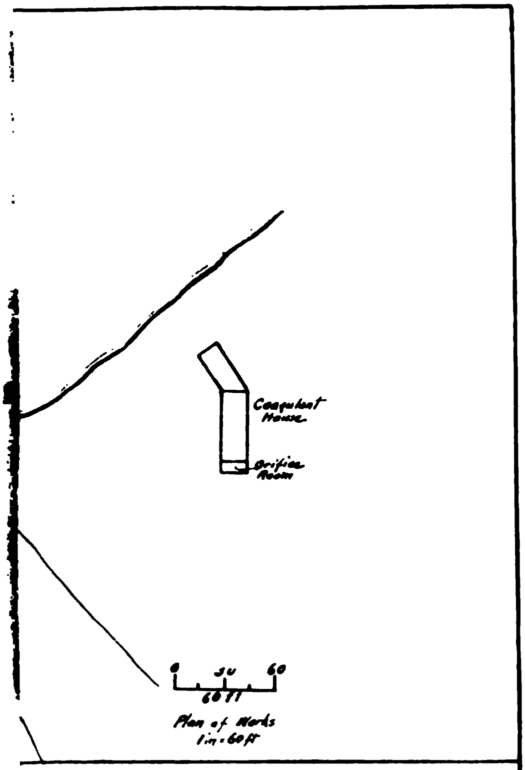
Pumps.— One Dean-compound 2,000,000 gallon, one Worthington triple expansion 3,000,000 gallon, operating under a dynamic head of 100 to 105 pounds, fed by one 150 H. P. boiler and two 75 H. P. boilers.

Purification Plant.— Owing to the peculiar conformation of the land a unique construction has been possible, as shown by the accompanying plans. A high earthwork dam maintains the water level high above the pump and filter house. On a level with the pump house a steel standpipe open at the top and provided with four baffles extending from top to bottom serves as a coagulation basin — the raw water flows by gravity from the reservoir to the standpipe, receiving the coagulant as it enters. The coagulant is fed from a special "alumhouse" situated on the top of the bank above the storage reservoir level. From the coagulation standpipe the water flows to the pumps, whence it is pumped through the filter to the mains.

Filters.— Four 8 x 25 horizontal mechanical pressure filters, American Pipe and Construction Company system. (No plans available at plant, but construction said to be the same as that at Mamaroneck), if so, the construction is as follows: A 6-inch manifold carrying 2 rows of 10 parallel 2½-inch black iron laterals, each 10 feet 9½ inches long. Each lateral carries 34 slotted "Pittsburgh" bronze strainers in 2 rows, staggered on the under side, 90° apart and 8 inches center to center. At the far end the lateral carries an elbow with a single strainer, directed up.

At the bottom of each tank there is eighteen inches of concrete. The manifold rests upon this concrete and a brick supports the lateral at the far end, raising it 3½ inches above the concrete.

Over the strainers there is said to be six inches of quartz gravel and 33 inches of sand.


Coagulant House
Orifice Room
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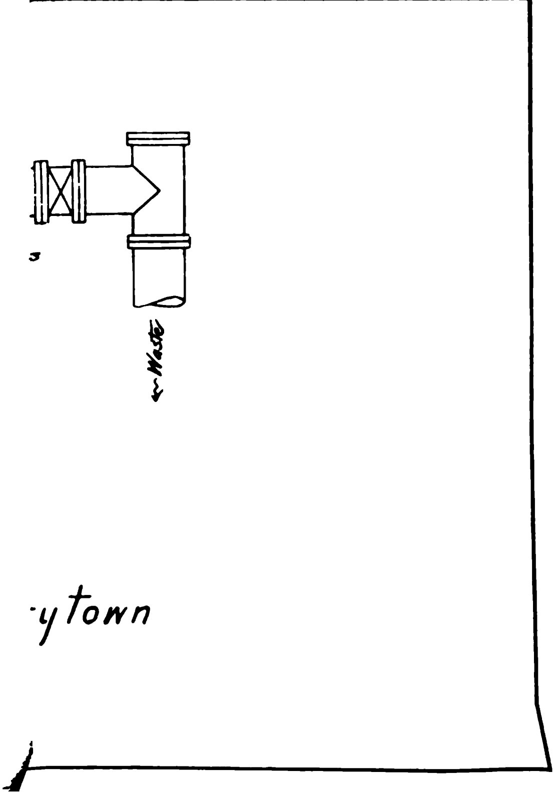
Plan of Works
1 in.=60 ft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Waste
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NORTH TARRYTOWN — INTAKE WELL AND RESERVOIR.

NORTH TARRYTOWN — PUMP, ENGINE AND FILTER HOUSE.

NORTH TARRYTOWN — COAGULATION STAND PIPE.

NORTH TARRYTOWN — ALUM HOUSE ON TOP OF BANK AT LEFT — COAGULATION STAND PIPE AT FOOT OF BANK AT RIGHT.

North Tarrytown — Coagulant Storage and House Containing Coagulant Applying Device.

North Tarrytown — Pump Room.

The influent enters the building through a 16-inch line reduced to eight inches where the water enters the top of the filter tank. The waste pipe is also eight inches.

The filters are operated at a rate of 750,000 gallons per day each, all four units are kept in service.

Coagulant.— Basic aluminum sulphate (from Harrison Brothers, Philadelphia) is dissolved in a wooden hopper, holding 250 pounds, immersed in a circular 3 x 4 feet cypress tank through which a small stream of water flows, entering at the bottom on one side and escaping through a small pipe on the opposite side near the top. The quantity of coagulant applied is controlled by raising or lowering the hopper. When raised it is claimed that the coagulant is dissolved much less rapidly than when lowered and more deeply immersed in the water, thus materially changing the concentration, and, it is asserted, proportionally altering the strength of the solution flowing from the tank. The effluent from the tank flows into a funnel and pipe and thus to the raw water as it enters the steel coagulation tank. From 250 to 500 pounds of coagulant are employed per twenty-four hours. If the normal rate of pumping is 3,000,000 gallons per twenty-four hours, the rate of application of coagulant must be from 6/10 of a grain to 1.2 grains per gallon. The coagulation standpipe is cleaned once each week, on Saturday.

Washing the Filters.— This is accomplished by reversed flow, and utilizing the tank pressure from the standpipe at Ardsley, the pumps holding a pressure of 100 to 105 pounds at the same time — the standpipe alone giving sixty pounds. It is stated to be the practice to wash one tank every two hours, or if there is much algae in the pond, one every hour. From ten to fifteen minutes are required for washing a filter. There are no reliable figures available as to the amount of wash water used, but your inspector estimates that it must lie between five and fifteen per cent, according to the character of the water. During the period of several hours spent in inspection of the plant no filters were washed, hence it is probable that the period between washings is considerably over two hours, as claimed.

Character of the Water.— Detailed analyses could not be obtained, the analyst at the plant stating that he did not keep copies of the daily record but forwarded them to the main office. According to him the raw water varies in bacterial contents from 200 to 30 colonies on gelatine per cubic centimeter, and the filtered water from 0 to 5 colonies per c.c. These results are, however, inconceivable and can not be correct. The raw water certainly has an average bacterial content several times as great since the source of supply is a polluted one. As for the filtered water, a pressure filter yielding an effluent containing a maximum of only 5 bacteria per c.c. has not yet been constructed.

Distributing System.— Sixty to sixty-five miles of 16-inch to 3-inch castiron pipe.

ONEONTA

City. Population 8,100. Situated on the southern border of Otsego county on the Susquehanna river. On the D. & H. R. R.

Plant.— Gravity system. Two storage reservoirs, small distributing reservoir. Six pressure mechanical filters. Distributing system.

Owned and operated by Oneonta Water Works Company.

Cost of plant not ascertained.

Reservoirs.— The upper reservoir, three miles from the filters, feeds into the lower, one mile from the plant. Their aggregate capacity is stated to be about 500,000,000 gallons. The catchment area comprises about 4,000 acres of pasturage and farm land. The run-off is therefore more or less polluted according to conditions and seasons.

Filters.— The filter house is so built as to afford a residence for the man in charge of the plant; all of the second floor with the exception of room directly over the valves of the filters, used as an operating floor, is given over to living-rooms.

The filters are housed in a portion of the first or ground floor. They are six in number, New York system, steel-tank horizontal-pressure filters, 8 x 20 feet, following the usual construction of this type.

Three headers, extending through the tank lengthwise, resting on concrete and dividing the space into four equal portions, carry the strainers. The strainers are of the New York system con-

North Tarrytown — Mechanical Pressure Filters.

Oneonta — Filter House.

ONEONTA — OPERATING FLOOR — VENTURI METER IN BACKGROUND.

ONEONTA — PIPING OF MECHANICAL PRESSURE FILTERS — COAGULANT DRUM IN FOREGROUND AT RIGHT.

struction, large cone strainers imbedded in concrete so that only the hemispherical top is above the concrete level. The center header is six inches and carries twenty-seven strainers on each side. The side headers are four inches and each carries twenty-four strainers, making a total of 102. The headers project a few inches beyond the tank, connecting with a 5-way manifold, with three 4-inch, one 6-inch and one 8-inch opening, two of the 4-inch openings serving as connections with the side headers; the third 4-inch at one end of the manifold serves for filtering to waste. The 6-inch opening joins on the 6-inch central header and on the opposite side the 8-inch orifice is fitted to an 8-inch pipe discharging into the main effluent line, 24-inch. Above the strainers is said to be a layer of gravel and then probably about three feet of coarse sand. The depth of sand and gravel could not be learned at the plant.

The influents under a pressure of thirty to thirty-five pounds enter the tanks at the top, eighteen inches from the end, in 8-inch lines offset in 45's so as to allow valve-risers to be carried through to the operating floor overhead.

All six filters are generally in service and are washed every twenty-four hours or oftener, if necessary, three of the units being washed at once.

In washing, the usual method, by reversed flow, is followed, one header being opened at a time and run until a sample taken shows the water to be clear. Finally all three headers are opened at once and the sand washed by reverse flow until the effluent to the sewer runs clear. Thirty minutes are usually required to wash a filter.

Each filter is provided with pressure gauges on influent and effluent lines, but the loss-of-head is not used as a guide for washing unless the water is turbid or carries much organic material in suspension.

Coagulant.— " Lump alum "— " egg size "— nonbasic — supplied by the Pennsylvania Salt Company of Philadelphia, is employed. The coagulant is placed in castiron drums 24 x 30 inches in which it is slowly dissolved by a shunt current of raw water passing down into the drums and out into the raw water line again. For this purpose ¾-inch bronze pipes are used. On the discharge pipe a valve is provided with graduated circle and index, serving to indicate the rate of flow of the coagulant.

There are two coagulant drums side by side. An average of one barrel of coagulant per week is required under the present system of operation.

Attempts to obtain data from the superintendent relative to the distributing system, consumption, cost of operation, etc., and analyses showing the purification accomplished, have failed.

PLEASANTVILLE

Incorporated village. Population 1,600 to 2,000. Situated at the center of Westchester county on N. Y. C. & H. R. R. R.

Plant.— Pumped system, with distribution by compressed air. One storage reservoir. One mechanical pressure filter. Two Smith-Vaile pumps, two air compressors, two Nash gas engines, two air tanks, two water tanks, two clear wells, distributing system. Owned and operated by municipality.

The village has installed the system of the Acme Water Storage System Company of New York, in which the water, filtered by a New York system vertical pressure filter, is pumped into steel tanks and forced to the village under air pressure.

The pump house contains one 8 x 7 vertical pressure filter of standard New York System construction.

Two Smith-Vaile 7 x 8, three cylinder power pumps.

Two Nash gas engines, rated at 23,000 gallons an hour each, but falling far short of their rating.

One Clayton, one cylinder air compressor.

One Fairhurst, two-cylinder air compressor.

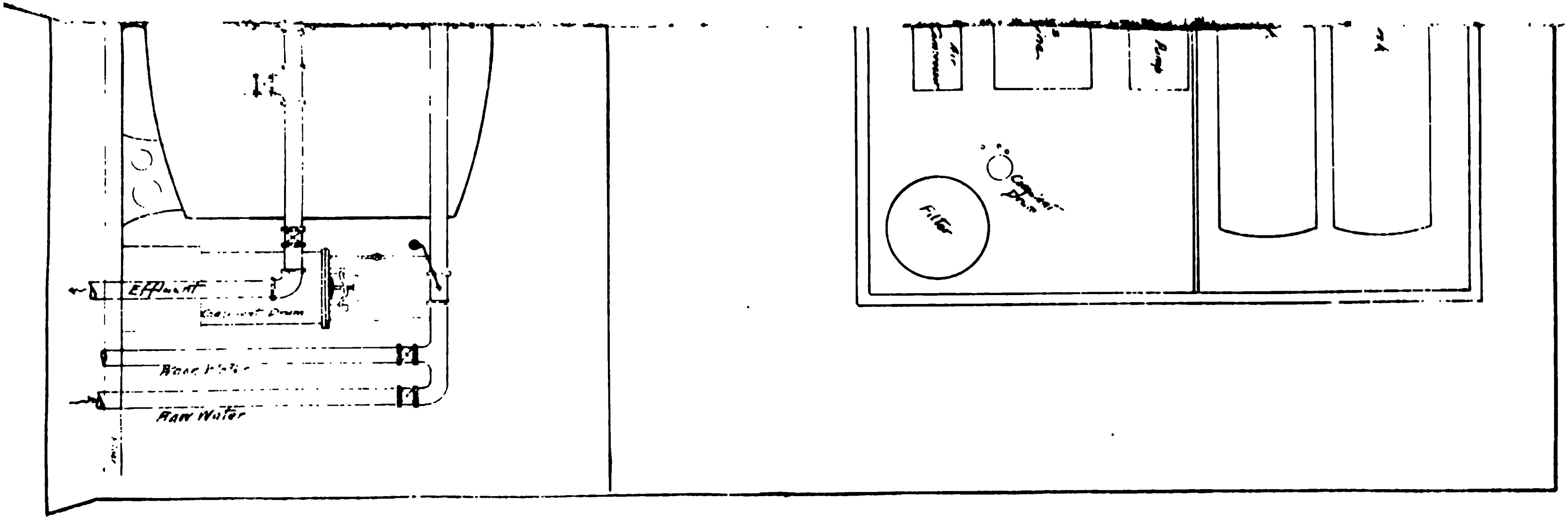
Two sets of Acme system automatic air-pressure regulators.

Two 8 x 33 feet air tanks.

Two 8 x 33 feet water tanks, holding 12,500 gallons each.

Source of Supply.— A small brook. One-fourth mile east of the pump station an earth dam with concrete spillway and masonry gate house was constructed in 1908. The small impounding reservoir thus formed has a surface area of a little over an acre and a depth of five to ten feet.

An 8-inch cast iron main extends to the pump house where it *reduces* to six inches on each pump.


Effluent
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PLEASANTVILLE — RESERVOIR AND INTAKE GATE HOUSE.

PLEASANTVILLE — INTAKE, GATE HOUSE AND DAM.

Pleasantville — Pump, Engine and Filter House.

Pleasantville — Pump, Engine and Filter House — Covered Reservoirs — Caretaker's Residence in Background.

Filter.— Formerly a covered sand and gravel filter was in use, but in 1908 the filtering material was removed and the pit resulting converted into a clear water well for the water treated by the new mechanical filter. The old clear well now serves as an auxiliary clear well.

The new filter consists of one unit, vertical pressure mechanical filter, New York system, 8 x 7 feet provided with three 4-inch headers, each one carrying ten large " New York " cone strainers, imbedded in concrete. Over the strainers are nine inches of coarse gravel and then sand to the top of the perpendicular sides of the filter tank. Influent, effluent and wash water lines are 4-inch. The wash water line is taken from the water tanks operating under air pressure and the filter is washed with the pumps and air compressors working, giving an available pressure of seventy-five pounds, but the full pressure is never used, the valve on the wash water line being only opened sufficiently to thoroughly stir up the sand.

Crystallized double alkali aluminum sulphate is employed as coagulant. A 29 x 18 inch drum is attached by ½-inch brass pipes to the influent main so as to shunt a slow stream of the raw water through the alum charged drum, a butterfly valve with weighted lever between the points of attachment of the brass pipes insures a fairly even rate of flow through the drum. The coagulant drum is charged twice or three times a week. The rate of application is gauged by opening or closing valves on the brass pipes. Ordinarily these valves are opened one-eighth of their full capacity.

The filter is washed every evening, one header being opened at a time until the water runs clear. Then all three are opened at once. One-half to one hour is required for washing. When clean the filter is usually allowed to discharge to the clear well at once without preliminary filtering to waste (rewash). Occasionally, however, the water is wasted one to three minutes.

No tests of the efficiency of the filter have been made. It is probable that the bacterial removal is very low.

Distributing System.— A few miles of 8 to 4-inch cast iron pipe, about 200 service taps. Very few metered. Pressure fifty to one hundred pounds.

Average per capita consumption calculated from the available data and a population of 1,000 (200 x 5) gives thirty gallons per day, a value incredibly low.

PORT CHESTER

Incorporated village at the south-east corner of Westchester county on the boundary between New York State and Connecticut. Population 11,500. On the New York, New Haven & Hartford Railroad.

Plant.— Gravity system. Port Chester, East Port Chester (Connecticut), Rye, N. Y., and Greenwich, Connecticut, obtain their water supply from the Greenwich Water Company whose plant at Greenwich, Connecticut, consists of an upper reservoir known as Rockwood lake, capacity 400,000,000 gallons, constructed in 1897. Catchment area about 100 acres, this reservoir discharges through gates to a lower storage reservoir called Putnam lake, constructed in 1883, embankments raised in 1887, present capacity 300,000,000 gallons; catchment area 70 acres. The dam and embankments of Putnam lake are to be raised in 1909-1910 to increase its capacity to 600,000,000 gallons. The catchment areas of these artificial lakes are substantially free from pollution and are inspected and controlled by the Connecticut State Board of Health.

The plant at Greenwich comprises in addition a filter house containing eight mechanical pressure filters. A stand pipe of 1,250,000 gallons capacity acting as a balance on the system, and distributing system.

The water in the reservoirs in July, August and September usually develops bad odor and tastes.

Filters.— The filter house of masonry, 55 x 33 feet, contains four vertical steel tank 10 x 8 mechanical pressure filters with cone and copper slot strainers, Federal system (?) with rakes for stirring sand in washing, installed in 1887; two vertical steel tank 10 x 8 feet mechanical pressure filters with Deutsch strainers, Federal system without rakes, installed in 1903-04; two horizontal steel tank 20 x 8 feet mechanical pressure filters, New York system, with standard New York system large strainers.

In the four original vertical filters there is a layer of two to three feet of sand over the strainers, topped by about four feet of fine coke.

In the two Deutsch patent vertical filters there is about six inches of coarse quartz gravel supporting three to four feet of quartz sand.

In the two horizontal New York system tanks there is six inches of gravel and five feet of sand.

Each of the six vertical filters has a rate of 250,000 gallons and each of the large horizontal filters a rate of 500,000 gallons per twenty-four hours, making the total capacity of the plant 3,000,000 per twenty-four hours. It is stated by the superintendent that the capacity of the plant is soon to be increased by another 3,000,000 gallons.

The filters discharge directly to the mains, that part of the water not consumed enters the balance stand pipe. The stand pipe provides filtered water for reverse flow washing.

From two hours to two and one-half hours are required for the washing of all filters. Each unit is filtered to waste two to three minutes after washing, before turning the water to the mains. Filters are washed daily at 5.30 A. M.

The raw water before passing to the filters is treated with non-basic alum — General Chemical Company "cracked alum"— dissolved in cast iron drums and introduced into the raw water by a shunt circuit through the drums. Three drums are in service. Sixty pounds per day of coagulant are employed on an average, but as high as 250 pounds per day has been required to satisfactorily clarify muddy waters. The proper rate of application of the coagulant is judged by taking samples from the effluent pipes of the filters at intervals, increasing the dose by opening the valves of the shunt until the effluent runs clear.

Each year in the spring the filtering material is removed from the tanks and replaced by new, that which was removed being discarded.

During the winter months it is possible to throw three of the vertical filter units out of commission, since the winter consumption of water is less than the summer.

Monthly analyses of the water are made by James A. Newlands at the laboratory of the Connecticut State Board of Health. The following are the results obtained in 1909 up to the date of inspection.

	Filtered water Jan. 26	Filtered water Feb. 24	Filtered water March 18	Raw water April 26	Filtered water May 26
Color	41.	23.	29.	20.	25.
Odor	0.	0.	0.	0.	0.
Turbidity	14.	8.	9.	12.	14.
Total solids	46.	47.	53.	42.	49.
Loss on ignition	22.	18.	23.	13.	23.
Nitrogen as free ammonia	0.042	0.034	0.124	0.076	0.012
Nitrogen as albuminoid ammonia	0.102	0.164	0.128	0.150	0.094
Nitrogen as nitrites	0.	0.	0.	0.	0.
Nitrogen as nitrates	0.08	0.12	0.13	0.12	0.05
Oxygen consumed	3.62	3.62	3.72	3.40	5.37
Chlorine	2.3	3.16	3.64	3.42	3.18
Alkalinity	18.	16.	15.	13.	15.
Total hardness	22.	27.	26.	25.	25.
Bacteria on gelatine at 20°	115.	115.	90.	295.	190.
Bacteria on agar at 37°	60.	45.	22.	70.	35.
Per cent. gas in dextrose	90.	0.	0.	90.	0.
Per cent. gas in lactose bile	0.	0.	0.	0.	0.

It is to be regretted that no analyses have been made of both raw and filtered water in order that the degree of purification might be determined. A turbidity of eight to fourteen in the effluent of a rapid system filter using alum as coagulant, generally indicates that the filter is far from accomplishing that which is to be expected of it.

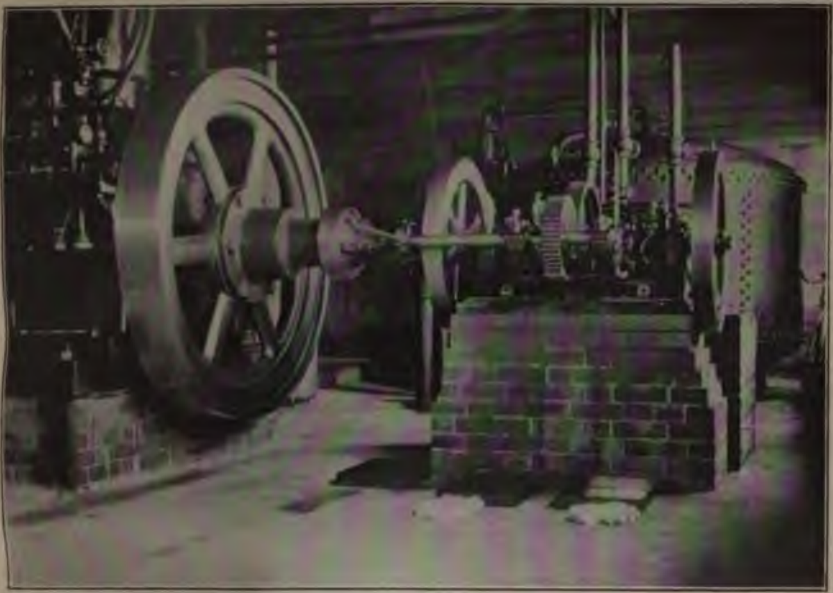
Distributing system.— In Port Chester and Rye and part of East Port Chester. Thirty-five miles of 16-inch to 4-inch castiron pipe, 2,450 service taps (+ 350 in East Port Chester), of which 1,300 are metered. Pressure on mains ninety to ninety-five pounds, but in summer the pressure is eighty-five to ninety pounds. Port Chester's consumption is not known.

RENSSELAERVILLE

Unincorporated village. Population 350. Southwest section of Albany county, fifteen to twenty miles from nearest railroad.

Plant.— Gravity system. Covered distributing reservoir. Small charcoal filter. Gravel filled infiltration trenches. Small lake as impounding reservoir. Distributing system. Owned and operated by village. Cost to date, $5,500.

Supply.— A very crude 30 to 35-foot timber and masonry dam 1 foot high across the outlet of Myosotis lake (one-half mile up-



PLEASANTVILLE — GASOLINE ENGINE, AIR COMPRESSOR AND MECHANICAL FILTER PLANT.

RENSSELAERVILLE — INTAKE OF GRAVEL FILTER TRENCH AT LOWER RIGHT CORNER — CRUDE DEFLECTING DAM.

RENSSELAERVILLE — END OF GRAVEL TRENCH AND INTAKE TO CHARCOAL FILTER.

RENSSELAERVILLE — COVERED DISTRIBUTING RESERVOIR AND CHARCOAL FILTER PIT.

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stream), deflects a part of the flow to a 30 x 36-inch plank box with a grating of wooden slats. From this intake crib, a line of 4-inch iron and tile pipe with loose joints is laid in a 50 x 2 x 4 feet deep trench and covered with gravel. This covered pipe extends to a 50-foot infiltration trench provided with a 6 x 3 foot timber and masonry collecting well whence proceeds a 4-inch reducing to 3-inch castiron main to the charcoal filter and the covered distributing reservoir, one-half mile to the northwest.

It is not clear what the village expects to gain by the gravel covered pipe, the statement being that the water in excess of the flow of the pipe percolates through the gravel to the infiltration trench or basin, and that in a very short time after laying the pipe becomes so clogged with sand and gravel that the entire supply is obtained by percolation. This pipe was relaid and gravel renewed in 1908.

Myosotis lake is a privately owned spring-fed pond of 150 to 160 acres, twelve to twenty-five feet deep, having a catchment area of some 3,000 acres, sparsely timbered, mostly in farm and pasture land.

Charcoal filter.— Six feet from the corner of the covered distributing reservoir is a 3-foot x 4-foot x 9-foot board covered masonry well, divided in half by a weir. One-half is filled with lump charcoal, the water enters through a 3-inch line at the top of the filter well, passes down through the charcoal and enters the reservoir through a 3-inch line. The east wall of the filter well acts as a weir, allowing an overflow to waste when the reservoir is filled. The superintendent states that the charcoal has not been removed in nine years.

Distributing system.— Four thousand feet of 4-inch and 3-inch pipe, forty service taps. Pressure eighty-five pounds. No meters.

Efficiency.— No analyses available. Charcoal which has been in use for nine years cannot be expected to act as even a satisfactory strainer, but in all probability yields at times an effluent higher in bacteria than the untreated water. The present system is badly planned and poorly constructed and needs further inspection and analyses.

SUFFERN

Incorporated village. Population about 3,000. Southwest border of Rockland county, on the Ramapo river, and on the Erie railroad.

Plant.— Pumped system. Storage reservoir. Cobble-stone strainer, charcoal filter, clear water well. Pump house. Distributing reservoir. Distributing system. Owned and operated by municipality. Cost to date a little over $50,000.

Pump House.— Twenty by thirty-five feet with a center pit twelve feet deep in which are installed two 25 H. P. Nash gasoline engines, each directly connected with a Rumsey three-plunger vertical 8 x 10 pump, throwing 320 gallons per minute. Seventy-six pounds head are required to raise water to the distributing reservoir.

Source of supply.— A dam across the Mahwah river, one-half mile southwest of the village forms a narrow pond about one mile long with a surface area of about seven acres. Depth five to ten feet. The river extends about eight miles above the dam and is a moderately polluted sluggish stream.

During the summer months the pond is treated every two weeks with eighty to ninety pounds of copper sulphate, to prevent bad odors and tastes.

A number of dwellings are clustered about this impounding reservoir and their yard surface-wash flows to the stream. The house privies, however, are provided with cement vaults built by the municipality to protect its water supply.

Purification system.— From the storage reservoir the water flows through an 18-inch tile to a pile of loose masonry and cobblestones acting as a strainer and through this to a small intake well and thence to the charcoal filter, an 8 by 5 by 10 foot concrete pit containing thirty barrels of lump charcoal covered with large stones to hold the charcoal down. The water flows on the top of the charcoal, sinks through it and is led away to the clear well through a 10-inch tile line. The clear well is circular, brick lined, and was originally 43 feet deep, but owing to the presence of quicksand is now 40 feet deep.

The charcoal in the pit was renewed in the spring of 1909. The material removed had been in use for three years.

SUFFERN — INTAKE AND CHARCOAL FILTER — PUMP HOUSE AND WELL TOP OF BANK.

SUFFERN — PUMP HOUSE AND COVERED WELL.

Reservoir.— The distributing reservoir is situated on a hillside about one-fourth of a mile from the filter and pump house. It has a capacity of about 250,000 gallons.

Distributing System.— Several miles of cast-iron mains 8 inches to 4 inches, 360 three-fourths inch service taps, all metered. Pressure on mains 75 to 90 pounds. Average per capita consumption is said to be 50 gallons daily.

Efficiency.— No analyses have been made. The removal of bacteria by the system is probably so low as to be considered as zero.

TARRYTOWN

Incorporated village. Population 5,500. Southwest of the center of Westchester county on the Hudson river. On the N. Y. C. & H. R. R. R.

Plant.— Pumped system. High and low service. One storage reservoir, one open high service reservoir, elevation 520 feet, one high service covered tank thirty feet by thirty feet (not in use), one open low service reservoir, elevation 320 feet. One reserve reservoir not now in use. Series of infiltration wells, now abandoned. Five horizontal mechanical pressure filters, Federal system. Four Worthington pumps. Distributing system. Owned and operated by municipality.

Cost of plant:

Filters	$16,820
Filter house	14,180
Pumps and station	42,000
Total cost of water works	$550,000

Reservoirs.— Main storage reservoir formed by dam on Storm brook, a tributary of Nepperhan river. It has a surface area of about seventy acres, a capacity of 250,000,000 gallons and a catchment area of approximately 785 acres, one-third of which is wooded and not over three or four acres swampy. Inspected at frequent intervals and protected by State laws. At the upper end of the reservoir are several tenant houses affording more or less pollution. At the date of inspection, June 9, 1909, the authorities were experiencing not a little trouble with one of these houses then being used as a tenement. All available measures were apparently being adopted to safeguard the supply.

The storage pond is divided by an earth dam serving as a main highway into two approximately equal parts, intercommunicating by a sluice. There thus exists a menace of possible infection at any time.

The open low service distributing reservoir has a capacity of 1,000,000 gallons and an elevation of 320 feet.

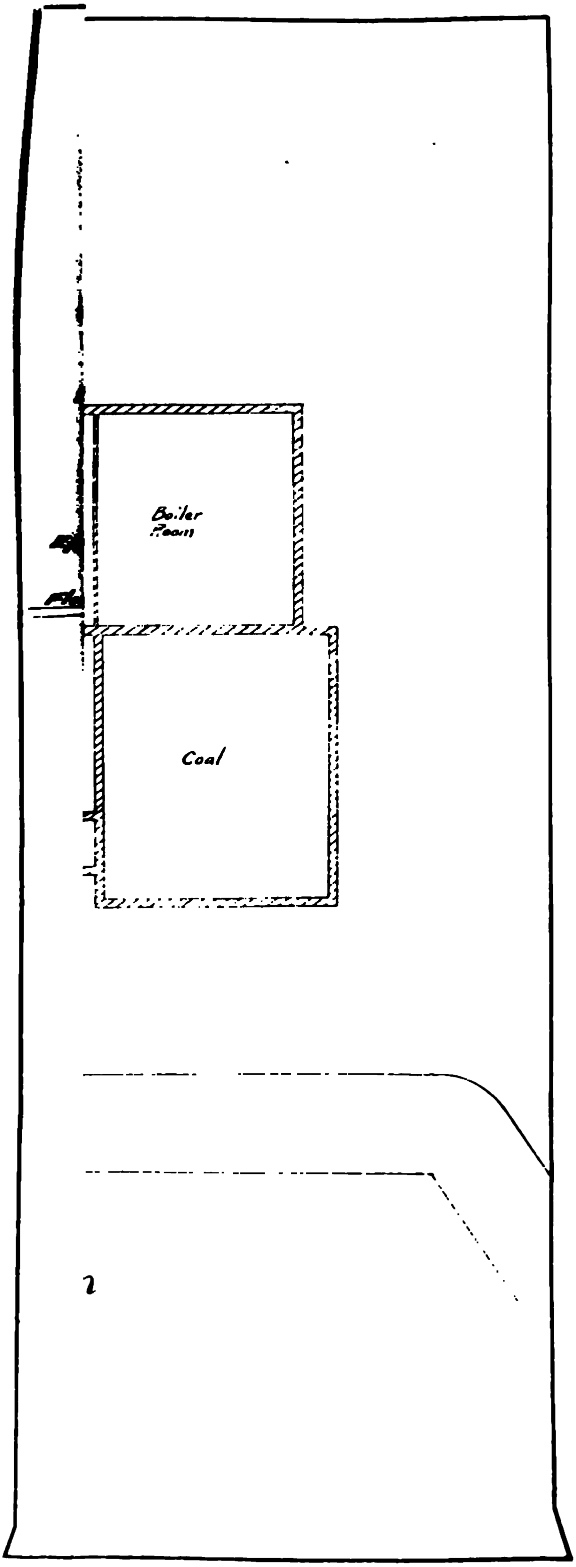
The open high service reservoir has also a capacity of 1,000,000 gallons and an elevation of 520 feet.

There are in addition two other reservoirs, now abandoned, a high service covered tank thirty by thirty feet, holding 157,000 gallons, and a small reservoir of 260,000 gallons, formerly maintained as a reserve supply.

An attempt was made some years ago to obtain water by sinking a number of infiltration wells from fifteen to fifty feet deep and pumping from them, but the water thus obtained became so highly impregnated with iron that their use was abandoned.

Pumps.— To the original pump and boiler house, one and three-fourths miles east of the village, a filter house addition has been added, so that at the present time the works consist of a single building with pumps and filters in adjoining rooms. There are four steam pumps, all Worthington; two of 1,000,000 gallons and two of 2,000,000 gallons capacity. On the high service the pumps operate under a static head of 126 pounds and a dynamic head of 130 pounds. On the low service under a static head of forty pounds and a dynamic head of ninety pounds.

Filters.— Five horizontal mechanical pressure filters in steel tanks eight by twenty-five feet, Federal system, Deutsch patents. Two of the units are on the high pressure service and three on the low pressure. The raw water after the application of coagulant is pumped through the filters to the mains leading to the reservoirs. There is no intermediate clear well. The construction of the filters is as follows:



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Tarrytown — Pump, Filter House and Intake.

Tarrytown — Pump House and Filter House — Spillway from Reservoir in Middle Distance.

An 8-inch effluent line enters the tanks at one end extending lengthwise through a layer of concrete to the center where it joins a 6-inch manifold carrying the laterals. This manifold is half imbedded in concrete and extends to within nine inches of the ends of the tanks. At right angles on each side are parallel rows of 2-inch black iron laterals six inches apart center to center, forty-six on each side. At each end there is a short cross lateral screwed into the capped end of the manifold. The laterals carry Deutsch strainers, tapped to ¾-inch, six inches apart center to center, each, on each side carrying seven, the end one being directed up by an L. Total number of strainers, including short cross laterals and four strainers at right angles to the last long laterals, 684.

Above the strainers is a 6-inch layer of gravel, and above this three feet of silica sand obtained at Long Branch, L. I., the effective size of which is not known, no sand analyses having been made.

The influent from an 8-inch pipe flows into a trough or distributor at the top of the filter tank. This trough is one foot in diameter by one foot, four inches deep. Two and one-half inches from the top a series of holes one inch in diameter, six inches center to center allow the entering water to escape and serve to distribute it evenly over the sand bed.

The filters are washed by reverse flow in the usual manner once every twenty-four hours or oftener, if the water is very turbid, carries algae or if the bacteriological examination of the effluents shows a continued high count. The superintendent prefers to wash in accordance with the bacterial counts of the effluents rather than be guided by loss of head indications. From ten to twenty minutes are required to wash each tank, with every now and then a thirty to forty-five minute wash. Following the wash the filters are run to waste two minutes, after which the effluents are turned into the mains.

No measurements of the quantity of wash water required have been made, but the percentage waste must be very high at times in order to properly cleanse the bed and remove organisms lodged in the lower parts of the beds and underdrains.

The wash water is obtained from the high service reservoir and

TARRYTOWN — MECHANICAL PRESSURE FILTERS — LABORATORY IN BACKGROUND.

TARRYTOWN — MECHANICAL PRESSURE FILTERS.

The average daily consumption is approximately 700,000 gallons, calculated from plunger displacement of the pumps. The consumption is much higher in summer than in winter because of the greatly increased summer population.

The daily per capita consumption probably lies between 125 and 130 gallons.

Efficiency.— The following are monthly averages calculated from detailed analyses furnished by Superintendent Merritt.

Bacteria Per Cubic Centimeter

	Raw Water			Coagulated Water		
	Maximum	Minimum	Average	Maximum	Minimum	Average
1908.						
May	572	194	356	295	102	202
June	410	194	322	310	93	193
July	400	181	249	261	105	169
August	510	176	295	229	59	149
September	550	194	274	305	61	159
October	336	81	201	210	67	123
November	281	64	155	253	29	120
December	369	112	236	208	63	182
1909.						
January	682	273	450	630	174	395
February	600	196	370	502	169	295
March	560	207	378	490	167	333
April	750	310	537	670	224	447
May	1,270	102	610	970	98	494

Bacteria Per Cubic Centimeter

	Effluent Low Service				Effluent High Service			
	Maximum	Minimum	Average	Average per cent. removed	Maximum	Minimum	Average	Average per cent. removed
1908.								
May	61	15	30	91.5	255	10	39	89.0
June	110	7	32	90.0	96	7	27	91.6
July	51	9	31	87.5	51	9	24	90.0
August	181	14	40	86.4	71	9	26	91.1
September	41	12	22	91.9	61	6	19	93.0
October	32	7	16	92.5	21	4	11	94.5
November	65	9	18	88.3	20	6	11	92.7
December	61	5	17	92.8	97	4	15	93.6
1909.								
January	*137	11	*46	89.7	93	7	27	94.0
February	600	15	164	55.1	376	5	43	88.3
March	†452	6	52	86.2	112	4	23	93.9
April	112	11	31	74.2	71	7	21	96.0
May	41	7	18	97.0	29	4	18	97.0

* On January 30th the effluents of the low service gave a count of 630 colonies per c.c. This excessively high count has been omitted from the average — next highest count 137.

† On March 2d, if this were excluded from the average the next highest count is 112 and the average per cent. removed becomes 89.4.

It appears from the daily analyses averaged above that in the case of the low service effluents the number of bacteria per cubic centimeter exceeded 100 only twenty days during the thirteen months, May, 1908 to May, 1909, while in the case of the high service effluents a count of over 100 bacteria per cubic centimeter was obtained on four days only during this period.

If, therefore, the samples taken for analysis were representative ones, it is to be concluded that the plant is doing effective work and that with competent supervison and constant watching a satisfactory effluent may be obtained. Without such supervision the plant would doubtless prove unsatisfactory and even a menace, subject as it is to a common fault of pressure filters,—that of yielding at times a worse effluent than the raw water. During the period covered by the above tabulated analyses on five days the filter effluents at the time of sampling were higher in bacteria than the applied raw water. These days and results were as follows:

	Raw water	Filtered water
January 30, 1909	464	630
February 1, 1909	387	421
February 2, 1909	264	600
February 19, 1909	328	389
March 2, 1909	287	482

The question always arises in such cases as to the probable duration of these abnormal conditions. These figures are given as material in support of the argument that direct connection of mechanical pressure filters to distributing mains is undesirable, and that the installation of a clear well will usually tend toward dilution and subsidence and therefore to a greater uniformity in the character of the water, and reduce to a minimum the danger of supplying an infected water to consumers.

WARWICK — SECOND OR MIDDLE RESERVOIR.

WARWICK — INTAKE IN FIRST OR LOWEST RESERVOIR.

WARWICK — THIRD OR UPPER RESERVOIR.

WATERTOWN — SODA ASH APPLYING DEVICE — CYPRESS DISSOLVING AND ORIFICE TANKS.

WARWICK

Incorporated village. Population, 2,100. Situated in southern part of Orange county on Warwick creek. On the L. &. H. R. R.

Plant. No purification system. Gravity supply consisting of three storage reservoirs (the lowest of the series acting also as distributing reservoir) and distributing system. Owned and operated by municipality. Lowest reservoir constructed in 1872, the second in 1893, and the third and highest in 1907–1908. Total cost to date $115,000.

Reservoirs.— Consist of a series of small ponds formed by earth and masonry concrete dams in amphitheaters in the valley of a rapidly flowing spring brook.

Reservoir No. 1. Capacity 12,000,000 gallons. Lies one and one-fourth miles south of and 145 feet above the village. Reservoir No. 2, capacity 30,000,000 gallons, lies to the south of No. 1, 1,600 feet up-stream, at an elevation of about 175 feet above the village. Reservoir No. 3, capacity 60,000,000 gallons, lies 300 feet to the south of No. 2 and at an elevation of approximately 60 feet above No. 1, or a little over 200 feet above the village.

The intake in Reservoir No. 1 consists of an 8 by 8 feet masonry crib, provided with 3 by 4 inch wood slats on the upper side. A 14-inch intake pipe is covered at the end with a copper wire screen of ¼-inch mesh.

Reservoir No. 1 is cleaned annually.

Distributing System.— Eight miles of 14-inch to 3-inch cast-iron mains; 392 service taps, of which 386 in use. No meters. Average pressure, fifty-five pounds. Per capita consumption estimated to be 2,000 gallons, of which a very high percentage is waste and leakage.

Quality of Water.— Watershed with very rapid run-off. No houses on shed, sparsely wooded and serving as pasturage for many head of stock.

The conditions existing about the upper end of the distributing reservoir on September 8th were deplorable. Cattle were wallowing in the little inlet, and enormous quantities of manure had been deposited upon the banks and in the water. A moderately heavy rain would cause very serious pollution. The superintendent reports that this filthy insanitary condition has existed for years.

The second and third reservoirs are subject to far less pollution.

This watershed needs further inspection and the formulation of rules for its protection.

WATERTOWN

City. Population 26,500. Situated at the center of Jefferson county on the Black river. On the New York Central & Hudson River Railroad.

Plant.— Pumped supply. Large pump house containing two Harmon 3¼ million steam pumps retained as an emergency supply. Six large and one small turbine pumps, of which Worthington's 12-foot, 5,000,000-gallon, forces the filtered water to the city and Lawrence 6,000,000-gallon takes the raw water from the river when the latter is low. The centrifugal pumps are all water power driven. One Root high pressure blower, water power driven. One Eager Electric Company 110-volt 100-ampere generator, water power driven. Filter house, containing eight mechanical gravity filters and accessories, laboratory and storage room. Alum storage house. Clear well, covered underground. Coagulation basin, covered underground. Distributing or balance reservoir. Distributing system. Owned and operated by municipality.

Source of Supply.— Black river, having an uncontrolled watershed of 1,800 to 2,000 square miles. A dark colored polluted stream. In addition to sewage, drainage, etc., the river is at times very badly polluted by the paper mills on the stream above Watertown, which discharge sulphite wastes and other objectionable matter into the river, rendering the purification of the water exceedingly difficult. An examination of the analytical data on the record books of the plant shows at once the serious nature and extent of this paper mill pollution. A state of affairs which should not be allowed to continue.

Watertown — Store House — Filter House.

Watertown — Filter House.

System of Development.— Half a mile above the pump house and purification plant a dam has been built across the river at a point where there is an island in the stream. This dam is high on the left bank side of the island and low on the right bank side. The crest of the low dam is two and one-half feet above the flow line of the coagulation basin. The intake consists of a wooden crib, forty feet from shore, thirty feet above the low dam, provided with wire screen sides with a gate inside placed below low water mark. At times other than low water there is a gravity flow to the coagulation basins and hence through the filters to the clear well whence the filtered water is pumped by centrifugals directly into the city mains; that which is not utilized backs up into the distributing reservoir balancing the system and providing fire protection. At times of low water, a Lawrence Engineering Company 6,000,000 gallon single stage centrifugal pump raises water from the river at the plant and discharges it into the coagulation basins.

At the far end of the operating floor is a hand operated gate serving to regulate the flow of water to the coagulation basin.

Purification Plant.— Designed by Hazen and Whipple. Completed and put in service in September, 1904, at a cost of $100,000. Strainer and air system have been twice overhauled since; the last time in 1907. The filter and alum houses are of cut stone, the remainder of the works reinforced concrete. Situated two miles southeast of the city on the left bank of Black river.

Coagulation Basins.— Two covered underground basins of reinforced concrete with arched roof; in parallel; each one 102 x 44½ x 10 feet, with a central board baffle dividing it into two sections with a 10-foot passage around the end of the baffle. A 12-inch gutter in the concrete floor, discharging into an 18-inch castiron pipe, serves to carry away the sludge in washing. A short length of 30-inch pipe from a 37½ x 10 feet inlet well allows the coagulated water to enter on one side of the baffle. After flowing the length of the basin around the end of the baffle, the sedimented water enters an influent well 12 x 10 feet through a short length of 30-inch pipe. From the influent well the water flows through the central pipe gallery of the plant in a 30-inch line from which 10-inch lines from reducing crosses lead the water to the filters. The average period of detention in the basins is six hours with a possible maximum of eight hours and a minimum of four hours.

The basins must be cleaned every two to five weeks, depending upon turbidities and colors of the water treated. Cleaning is accomplished by opening the waste gates and when the basins are emptied they are flushed by allowing the water to flow through. When the sludge is thick and tenacious recourse must be had to flushing with fire hose. Drainage of the basins requires two and one-half to three hours and flushing one-half to three quarters of an hour. The sludge varies from two feet to nine feet in depth according to the section of the basin, with an average depth of four to four and one-half feet over all. The 18-inch drainage lines from each basin discharge into a 6 x 11 well from which 24-inch tile line extends to the river. A waste line from the influent well also discharges into the drainage well.

Coagulation System.— Basic aluminum sulphate containing by contract not less than 17 per cent. water soluble alumina and at least ½ per cent. uncombined alumina, is used. Purchased from Lenning and Company, Philadelphia.

The coagulation system consists of alum dissolving tanks, orifice tanks and feed pipes on one side of the filter house just off the operating floor and soda ash tanks, orifice tanks and feed pipes on the opposite side. The alum dissolving tanks are concrete pits below the operating floor. These tanks are 10 x 10 x 4 feet, having at their upper front side a loose board dissolving box to hold the coagulant. From the dissolving tanks the " alum " solution is raised through hard rubber pipes by small bronze centrifugal pumps driven by Pelton water motors, to a primary orifice tank provided with Jewell slot orifice through which the solution flows to the secondary orifice tank whose discharge pipe may be fitted with a series of calibrated bronze ring weirs. These bronze weirs are so rated as give values convertible by tables to pounds of alum per million gallons of water treated. The Jewell slot orifice serves to regulate the rate of flow to the ring weir.

WATERTOWN — OPERATING FLOOR.

WATERTOWN — VALVE CONTROL TABLES ON OPERATING FLOOR.

WATERTOWN — OPERATING FLOOR.

WATERTOWN — COAGULANT APPLYING DEVICE.

These rings are three in number and have openings 0.54 inch, 0.77 inch and 1.09 inch. It is possible to vary the head under which they discharge and their rate under certain definite heads has been determined.

Hard rubber and lead pipes conduct the alum solution to the raw water line. Application may be made at a number of different points,— twenty-five feet outside the filter house, just inside the filter house, and just inside the regulating gate.

In the early spring when the river is full of snow water and at other times when the water is highly colored either because of swamp overflow or paper mill wastes, soda ash must be added to the raw water in order to increase its alkalinity before the alum solution is applied. The soda ash is dissolved in two water tight boxes or rectangular tanks on a platform some feet above the operating floor, the amount to be applied and the rate of flow is controlled by determinations of the alkalinity of the water thus treated. The soda ash dissolving tanks discharge into an orifice box provided with a bronze ring weir orifice whose rate has been determined under a fixed head. Quantities applied are so weighed out as to give results in parts per million.

The amount of the aluminum sulphate applied varies from a minimum of 225 pounds per million gallons to a maximum of 400 pounds per million gallons. Owing to the sudden discharge of sulphite and other paper mill wastes exceptionally close watching of the raw water is necessary and the amount of coagulant must be changed to meet these unforeseen variations in the character of the incoming water. Owing to these conditions in this plant the rate of application of coagulant must be regulated very largely by the amount of color in the raw water and not as is usually the case by turbidities. The superintendent regulates the coagulant so as to reduce the color to less than fifteen (Pt.—Co. Standard) in the filtered water.

Filters.— Eight rectangular reinforced concrete tanks 13 x 22 feet with iron gutters. Each with a 10-inch header in the center line from each of which spring twenty-five rows of 2-inch wrought iron laterals ten inches apart. Each lateral carries thirteen Norwood slotted T strainers six inches center to center set at a slight angle. Originally these strainer slots were 0.015

inch in diameter but they were enlarged by inserting a knife blade until at the widest part they are about 0.026 inch. Above the strainers are eight inches of graded gravel, four inches ½ to ¼-inch mesh, two inches ¼ to ⅛-inch mesh, and two inches passing through ⅛-inch mesh. Over the gravel there is three and one-half feet of sand from Felt Mills, N. Y., having an effective size of 0.35 mm. and a uniformity coefficient of 1.7. Imbedded under four inches of the gravel are the lines of brass air pipes to aid in scrubbing the sand in washing. A Root rotary high pressure blower in the pump houses supplies air under five pounds pressure. The air system consists of two 3-inch brass headers, extending the length of the filter bed each parallel with and three feet three inches from the center of the 10-inch collecting drain header. On to the under side of the air headers are screwed T's from which extend rows of parallel ⅛-inch brass pipes about five inches apart with rows of two 3/16-inch slots for the escape of air.

Owing to the clogging on the inside of the slotted strainers through tow fibers used in packings, two rows of Norwood strainers with circular orifices on the under side have been added to one filter bed for trial.

The filters are operated under a normal head of three and three-quarters feet maintained by a hand regulated valve on the raw water line. A fluctuation of six inches above or below normal is permitted. A constant rate of filtration is obtained from each filter bed by means of an adjustable Norwood Engineering Company controller, the construction of which is best understood by referring to the sketch on the plan sheets.

The filters are provided with head and loss-of-head gauges, but these are not often used to indicate that the filter bed needs cleaning. Filters usually run from ten to forty-eight hours between washings, rarely fifty-five to sixty hours. The average is a little less than forty-eight hours. The height of water in the clear well is carefully watched and as soon as it shows a tendency to fall, clean filters are placed in service and the dirty ones washed. The filters are washed by reverse flow for about eight minutes, air and water being admitted at the same time. Two or even three filters are washed at once. After washing the effluents are run to waste

for about eight minutes. All valves are Rensselaer hydraulic valves operated by levers on an operating table beside each filter.

The filters all discharge through their controllers into a subterranean concrete clear well with arched roof supported by pillars. It lies twenty-two feet from the filter house, is 148 x 56 feet and has a capacity of 790,000 gallons.

The following table (Table I) shows the quantity of water filtered and wasted, the results of bacteriological analyses of the raw and filtered water and the bacterial efficiencies of the plant in monthly averages for the years 1907 and 1908 as obtained from the averaging of daily examinations. These results are from analyses made by F. H. Jennings, superintendent and analyst of the plant.

TABLE I

MONTHLY AVERAGES OF DAILY RECORD 1907-1908. WATERTOWN, N.Y.

	WATER QUANTITIES DAILY IN THOUSAND GALLONS			BACTERIA PER CUBIC CENTIMETER		Per cent bacteria removed
	Water filtered	Wash water used	Water used in rewash	Raw water	Filtered water	
1907						
January	4,142	79	16	64,150	886	98.6
February	4,908	119	25	21,414	599	92.5
March	5,219	152	32	66,468	957	98.5
April	4,630	99	22	27,494	342	98.6
May	4,536	109	25	13,400	128	99.1
June	4,534	151	31	3,021	52	98.3
July	4,530	199	41	18,117	30	99.7
August	4,743	190	43	619	78	86.0
September	4,493	202	42	1,029	35	96.7
October	3,910	116	24	5,613	181	96.9
November	3,482	79	16	18,689	1,219	93.7
December	3,387	75	10	50,476	2,359	92.3
1908						
January	4,214	106	12	93,897	1,988	91.7
February	4,910	93	17	40,800	1,556	96.0
March	4,826	86	15	28,248	1,055	96.6
April	4,044	66	13	28,004	544	98.7
May	4,144	73	15	10,620	115	98.9
June	4,629	153	32	1,133	66	94.1
July	4,774	137	28	925	55	95.1
August	4,496	179	37	5,396	42	99.1
September	5,265	230	49	239	48	79.9
October	3,901	110	30	155	15	90.3
November	3,779	88	18	2,371	137	94.2
December	......	......	......	......	......	....
Average 23 months	4,413	125	26	2.186	543	95.0

The average per cent. of waste is 3.4.

The following are the average of the five years 1904-1908 daily determinations of color, turbidity and alkalinity.

	RAW WATER			FILTERED WATER		
	Maximum	Minimum	Average	Maximum	Minimum	Average
Color	140	38	65	23	0	7
Turbidity	200	1	10	1	0	0
Alkalinity	80	14	33	37	9	16

The analyses below, made in July, 1908, by George C. Whipple, may be taken as fairly typical of the character of the waters of this plant for this time of the year.

	Raw water	Filtered water
Turbidity	10	0
Color	65	8
Odor	1 v	1 v
N. as free ammonia	0.186	0.074
N. as albuminoid ammonia	0.018	0.016
N. as nitrites	0.002	0.001
N. as nitrates	0.15	0.05
Total solid residue	83	89
Loss on ignition	32	19
Chlorine	0.8	1.0
Alkalinity	32	17
Total hardness	34	40.5
Incrustants	2	23.5
Iron	1	0.1
Microscopic organisms	108	None
Amorphous matter	600	10

In January, 1909, at the suggestion of George C. Whipple, experiments were begun using chloride of lime as sterilizing agent. From January 20th to January 30th amounts varying from 0.4 to 3.9 parts per million of available chlorine were tried with the resulting bacterial efficiencies in the filtered water of from 92.3 per cent. (0.4 p. p. m.) to 99.97 per cent. (1.2 p. p. m.) and 99.95 per cent. (3.9 p. p. m.). From three preliminary runs an application of hypochlorite equivalent to 0.5 parts per million of available chlorine was decided upon with the following results.

TABLE II

DATE	BACTERIA PER CC.			Per cent bacteria removed
	Raw water	Filter influent	Filtered water	
February 11	9,870	......	193	....
12	5,020	......	57	....
13	8,870	......	36	....
15	5,150	......	11	....
16	1,200	1,080	38	....
17	2,900	270	53	....
18	3,125	1,450	63	....
19	4,110	1,260	55	....
20	7,860	1,230	54	....
22	8,130	2,200	217	....
23	11,130	2,620	400	....
24	6,550	2,510	130	....
25	13,820	2,500	65	....
26	9,780	670	13	....
27	9,270	2,160	41	....
28	3,860	500	3	....
March 1	6,380	1,210	31	....
2	6,480	860	116	....
3	4,340	1,520	145	....
4	4,850	1,300	152	....
5	5,860	810	103	....
6	3,660	1,880	87	....
7	3,900	450	200	....
8	3,980	......	162	....
9	2,035	......	142	....
10	2,100	......	47	....
11	6,100	......	151	....
12	5,400	......	203	....
13	13,960	......	109	....
14	9,000	......	138	....
15	5,900	......	176	....
16	5,880	......	54	....
17	3,780	......	25	....
18	1,860	......	100	....
19	5,750	......	191	....
20	2,060	......	114	....
21	2,270	......	267	....
23	3,840	......	192	....
24	3,550	......	235	....
25	3,800	......	250	....
26	68,730	......	675	....
27	46,440	......	390	....
28	47,430	......	300	....
29	17,550	......	99	....
30	16,540	......	18	....
April 1	10,310	......	402	....
	10,312	1,393	143	98.6

Although the results from the viewpoint of bacterial removal were excellent, 98.6 per cent. bacterial removal as against 95 per cent. without hypochlorite, it was found necessary to discontinue the treatment because of a peculiar odor and taste developed in the water which Messrs. Whipple and Jennings believe to be derived from the action of the chlorine upon the sulphite wastes in the water. This is greatly to be regretted, since Jennings estimates that the use of hypochlorite would have effected a saving of $1,000 or over, in the operating expenses of the plant and at the same time greatly increased its bacterial efficiency.

Further experiments are to be tried, however. The cost of treatment during the period covered was approximately twenty-nine cents per million gallons treated.

Superintendent Jennings has compiled the data below from statistics in the office of the city clerk relating to the prevalence of typhoid fever in Watertown before and after the construction of the purification plant.

YEAR	Estimated population	Number cases of typhoid reported	Typhoid cases per 100,000	Number typhoid deaths	Typhoid deaths per 100,000
1900	21,690	193	877	....	....
1901	22,400	150	670	....	....
1902	23,200	306	1,319	13	60
1903	23,900	231	967	12	50
1904	25,000	703	2,812	45	*180
1905	25,440	108	424	11	43
1906	27,500	130	†473	8	30
1907	30,000	103	†343	10	33

* Epidemic year.

† It is stated by the health authorities that at least 20 per cent of these cases were imported.

The cost of purification, exclusive of pump house expenses for 1909, is stated by Superintendent Jennings to be:

Labor, maintenance, salaries	$4,447 76
Coagulant and soda ash	5,277 66
Chloride of lime	82 06
Laboratory material	70 89
Heat and light	300 55
Total	$10,178 92

Total water filtered, 1,563,000,000 gallons.

From this data the cost of purification per million gallons in 1909 was $6.51. This is a slightly higher cost than that calculated from the data of previous years which give from $5.50 to $5.75 per million gallons.

Cost of power is not taken into account, since it practically costs nothing, being obtained from water power, and the amount of depreciation of the power plant cannot well be charged against the purification plant.

Distributing System.— Fifity-five miles of 24-inch to 4-inch mains (raw water intake thirty inches). Five thousand service taps, none of which are metered. Daily water consumption ranges between three and five million gallons. The average daily per capita consumption is believed to be approximately 150 gallons.

Pressure on the mains 40 to 110 pounds.

YONKERS

City. Population, 71,500 (estimated). Situated sixteen miles north of New York city on the Hudson river at the southern extremity of Westchester county. On the New York Central and Hudson River railroad.

Plant.— Pump supply from river and wells. Fourteen 6-inch tube wells, of which ten are in commission. Three pump stations. One storage reservoir; two distributing reservoirs; one water tower with tank; one 30 by 30 feet standpipe. Two open slow sand filters. Two covered slow sand filters in process of construction. One clear water well. Distributing system.

With the completion of the new covered filters many changes will be made in the arrangement and operation of the water works system.

Construction of system begun in 1874. Total net cost to 1908 $2,403,746.34, according to thirty-fifth annual report of board of water commissioners. To this net cost must be added the amount of the contracts awarded in 1908:

Two, covered, slow sand filters..................	$95,050 00
Prescott six million gallon pump................	21,790 00
New pump house, boilers, etc.	65,000 00

Source of Supply.— Formerly "from the Sprain and Grassy Sprain brooks or rivers, water collected in a storage reservoir formed in the Grassy Sprain valley by a dam; capacity of reservoir, 450,000,000 gallons; water shed, 3,210 acres, and from tube wells having a capacity of about 1,000,000 gallons per day. Since the installation of filters water is taken from the Saw Mill or Nepperhan river.

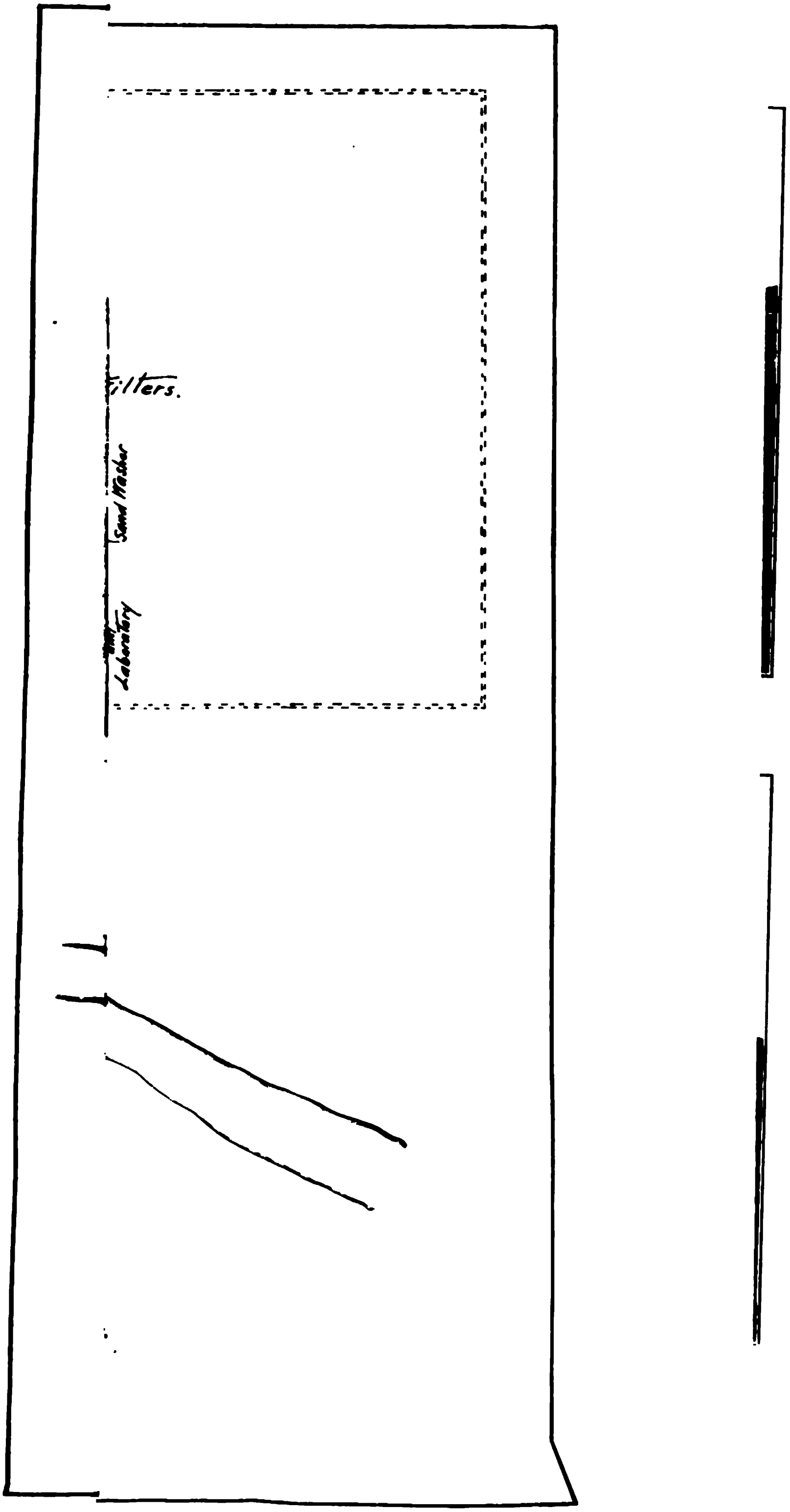
Quality of Supply.— The Grassy Sprain and tube wells are apparently now free from serious pollution as shown by inspections and analyses. Saw Mill river, however, is a badly polluted stream, receiving in addition to a polluted run-off the waste from the washing of the mechanical filters at Tarrytown.

Reservoirs.— " Fort Field " distributing reservoir in two sections with a total capacity of 60,000,000 gallons and giving a pressure on the mains of eighty-five pounds. The engines at the pump station pump into the mains against this head so that the reservoir acts as a balance to maintain pressure. This reservoir lies about 300 feet above the Saw Mill river. The " Fort Field " reservoir receives filtered water from the Saw Mill river, unfiltered water pumped into it from the " Grassy Sprain " storage reservoir or water pumped from the tube wells, according to conditions controlled at the main pumping station.

The " Lake Avenue " distributing reservoir, south of the " Fort Field," has a capacity of 4,500,000 gallons and is normally fed by the " Fort Field " reservoir. From the " Lake Avenue " reservoir a small pump station raises water to a water tower having a tank of 40,000 gallons capacity, and also to a standpipe holding 275,000 gallons.

Pump Station.— Since this report has to deal with the purification system an examination of the pumping engines at the filter station is alone necessary. In this station are housed a 6,000,000 gallon Prescott horizontal cross compound condensing high duty pumping engine to be used in connection with the new filters, a Wood 3,000,000 gallon compound, taking water from the old filters, and a Worthington of 2,000,000 gallons capacity pumping from the tube wells.

Filters.— In 1904 two open slow sand filters for treating the water of Saw Mill or Nepperhan river were installed, according to the plans of Engineer Allen Hazen. In the spring of 1907 contracts were let for the construction of two additional covered slow sand filters after plans of Hazen and Whipple. These new filters were to be completed in the fall of 1909. The purification plant is situated three miles northeast of the city.


Filters.
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YONKERS — PUMP AND ENGINE HOUSE.

YONKERS — SLOW SAND FILTERS, VALVE HOUSES AND SAND WASHER.

Old filters.— Each bed is rectangular, 180 by 120 feet, having a surface area of one-half an acre. Bottom and sides are of concrete. Lengthwise of the bed resting on the concrete is a 20-inch tile collecting drain from which extend, at right angles, parallel rows of split 10-inch tile as under drains, in 2 foot lengths, laid with open joints. The far end of each line is closed by bricks. piled against it. Between the under drains and just covering them is a layer of broken stone six to seven inches thick, supporting in turn about six inches of gravel. Above the gravel there is three feet of sand. On the front and dividing wall of the filters is situated the gate and regulator house, with raw and filtered water gate indicators of Venturi meter type, and loss-of-head gauges. These filters have a nominal rate of one and one-half million gallons per day, equivalent to a rate of 3,000,000 gallons per acre per day. There is no preliminary sedimentation basin and no coagulant or sterilizing material has been applied to the filter influents.

The initial loss-of-head shown by a clean filter is about three inches, and when the loss-of-head reaches three feet the bed is cleaned. This is done by draining the bed, allowing it to dry for at least a day and raking over the surface to thoroughly break up the crust formed on the surface. This requires about thirty laborers one day. The sand beds require raking every six or seven weeks; rarely the filters may stay in service for ten weeks. Once a year the beds are scraped thoroughly, the upper inch of sand being then removed with scoops and conducted to a three hopper sand washer. Sand is only washed in the old sand court when the river is very low and the weather fine. Unless the water is low the sand washer cannot be operated. After approximately three inches have been removed by scraping, the sand is replaced to bring the bed back to its normal original thickness.

After water has been admitted to a bed just cleaned, the effluent is run to waste twenty-four hours or until analyses show the effluent to be of satisfactory quality.

In winter much trouble is experienced with ice forming over the surface of the water and it is then necessary to keep a gang of laborers steadily employed breaking the ice coating, as fast as it forms.

The intake of the filters consists merely of an open pipe in Saw Mill river with a few planks driven into the mud, forming a curved fender on the up stream side.

The filter effluents flow by gravity to the clear well 55 feet by 43 feet by 15 feet deep and thence by gravity to the pumps.

New filters.— These have been completed since the time of inspection in accordance with specifications formulated by Hazen and Whipple. Each filter has a central collecting drain of concrete 4 feet 2 inches wide and 17 inches deep at the center. There are sixteen rows of laterals of 10-inch split tile fourteen feet apart laid upon the concrete floor in 2-foot lengths with open joints, with a space of three-fourth to one inch between barrels. The far ends of these under drains are closed by bricks piled against them. On the floor of the filters and surrounding the under drains is a 7-inch layer of broken stone a little larger than one inch mesh and less than two inches, above this two and one-half inches of gravel, three-eighths to one inch and two and one-half inches of fine gravel less than three-eighths inch. No gravel is placed within six feet of the inlet chambers nor within two feet of the walls, these spaces being filled with sand. The effective size of the filter sand is between .25 and .35 mm. with a uniformity coefficient less than 3. (The exact size of the sand could not be learned at the time the plant was inspected.) The sand bed is three feet thick, with the sand placed in the filter in three layers of one foot each. The main collecting drains discharge into 20-inch lines provided with Venturi meters in a regulator and laboratory building situated between the two filter beds. Just back of this building is a sand washing court, containing a sand washer and its appurtenances. This sand court is formed by part of the roof of the filters.

The whole filter is below ground level with reinforced concrete vaulted roof supported by square concrete pillars. The filter beds are each 224 feet by 154 feet and have a surface area of a little over three-fourths of an acre.

Distributing system.— There are 111.72 miles of 30-inch cast iron pipe; 6,982 service taps, all of which are metered. Pressure on mains, 45 pounds to 130 pounds.

Yonkers — One of New Covered Filters Before Laying of Underdrains and Filter Bed.

Yonkers — Sand Washer and Washing Spaces.

Average daily consumption, 7,966,600 gallons.

Average daily per capita consumption, 111 gallons.

The cost of purification could not be ascertained since the records show only the expense account of the various pump stations. In 1907 there was charged to the filter plant repair account $3,833.88, which probably includes all labor, etc., involved, but does not include salaries or cost of analyses.

The total expense of operating the entire water works system in 1907, was $101,749.61.

Cost per million gallons pumped $14.62.

The following are averages of weekly bacteriological examinations of the raw and filtered water made by W. D. Horne in 1907. The results for 1908 were not yet available at the date of inspection.

DATE	RAW WATER			FILTER NO. 1			
	Bacteria per cc.	Number of samples B. coli found in 1 cc.	Number of samples analyses	Bacteria per cc.	Per cent removed	Number of samples B. coli found in 1 cc.	Number of samples analyses
1906							
December	2,050	5	5	114	94.4	2	5
1907							
January	3,580	7	7	530	82.6	1	7
February	1,370	2	3	19	98.6	1	3
March	11,880	1	1	118	99.0	0	1
April	2,350	5	5	51	92.2	0	5
May	1,470	4	4	49	93.8	0	4
June	1,106	4	4	36	93.5	0	4
July	395	3	4	40	88.7	0	4
August	407	3	3	39	87.7	0	3
September	5,650	4	4	52	94.7	0	4
October	12,500	5	5	88	97.3	0	5
November	25,670	4	4	155	99.8	3	4
December	6,580	5	5	215	91.8	0	5
Average for year	5,630	......	......	138	97.6	......	....

DATE	FILTER NO. 2			
	Bacteria per cc.	Per cent removed	Number of samples B. coli found in 1 cc.	Number of samples analyses
1906				
December	132	94.1	2	5
1907				
January	470	86.0	2	7
February	30	97.7	1	3
March	117	99.0	0	1
April	60	90.8	0	5
May	73	90.8	0	4
June	63	91.1	0	4
July	86	74.7	1	4
August	48	87.0	0	3
September	64	94.6	0	4
October	185	95.5	0	5
November	200	94.7	1	4
December	102	96.2	1	5
Average for year	128	97.7	....	....

The average of all the monthly chemical examinations made in 1909 is as follows:

	Raw	Filtered
Total solids	127.7	115.5
Loss on ignition	36.5	30.7
Chlorine	6.1	6.2
Nitrogen as nitrates	0.45	0.43
Nitrogen as nitrites	0.005	0.002
Free ammonia	0.049	0.025
Albuminoid ammonia	0.161	0.088
Total hardness	67.4	74.8
Oxygen consumed	3.83	2.16

INVESTIGATION OF OUTBREAKS OF TYPHOID FEVER

INVESTIGATION OF OUTBREAKS OF TYPHOID FEVER

Although it is true that in many places in this State conditions exist which must give rise to an undue prevalence of typhoid fever and other water-borne diseases, it is also fortunately true that outbreaks or epidemics of this disease are not of frequent occurrence. When we consider that these outbreaks are always preventable, and therefore unnecessary, and that these epidemics are attended with human and financial loss that approaches in some instances almost a calamity, further emphasis is unnecessary to point out the grave and important duty of the Department in dealing promptly with them.

Whenever a case of epidemic of this disease is reported to this Department, it is at once investigated. Experience has shown that typhoid fever is very frequently associated in its cause with the water and milk supply or with some factor associated with general sanitary conditions in the community, and that in a search for the true source of trouble there is frequently necessary an intimate knowledge of engineering principles concerning water supply, sewerage or stream flow. For these reasons the work of investigating these outbreaks has devolved very properly upon the Engineering Division, and in every case a careful investigation is made to determine the source of infection and to recommend immediate action which should be taken to remove the cause and suppress any further spread of the disease.

During 1909 the Division was called upon to investigate and make reports in four cases of outbreaks of undue prevalence of typhoid fever in the following municipalities:

Camden.
Clayton.

Cooperstown
Richmondville.

CAMDEN

ALBANY, N. Y., *January* 16, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— In accordance with your request, I beg to submit the following report of my investigation of the cause of the undue prevalence of typhoid fever at Camden, the investigation having been requested of you by the local board of health.

On January 13th I visited Camden and met and conferred with members of the board of health, including Mr. Perin, president, Mr. Tuttle, secretary, and Dr. Borland, health officer, and discussed with them in general and in detail the occurrence of the cases of fever which have appeared during the past year, and especially those that have occurred since last September. I further made inquiry as to what steps and efforts the board had taken to determine the cause of infection, and discussed with them many other matters bearing generally upon the present typhoid situation. I also visited and inspected certain dairies in the vicinity, viz., the Crimmins, the Coates and the Sanford dairies, these three dairies being the principal ones that supply milk to the village.

It appears that beginning with last September there have occurred in the village at somewhat uniform intervals some fifteen pronounced cases of typhoid fever. These cases have not been confined to any particular section of the village, but have been more or less uniformly distributed over the village. A list of the cases with the dates of onset of disease, whether child or adult, and the milkman, is as follows:

NAME	Child or adult	Date	Milkman.
1. Buskirk	Adult	September 15	Sanford.
2. Costello	Child	October 15	Sanford.
3. Harding	Child	October 17	Sanford.
4. Pratt	Child	March 2	Sanford.
5. Crimmins	Adult	November 6	Sanford.
6. Farnsworth	Adult	November 15	Sanford.
7. Hilmer	Adult	December 17	Sanford.
8. Hale	Child	December 12	Coates.
9. Prichard	Child	December 15	Sanford.
10. Whitford	Adult	December 20	Sanford.
11. Colclough	Child	December 25	Coates.
12. Tiffany	Adult	January 1	?
13. Magee	Child	January 8	Sanford.
14. Von Winkle	Adult	January 12	Sanford.

The village has a present population of about 2,500, and, according to Dr. Borland, typhoid fever has been more or less prevalent for many years in the past, constituting some ten years ago epidemic proportions. During the past three or four years it has not been very prevalent until the fall of last year. It is evident that the occurrence of some fifteen cases of this fever in the last four months represents, on the basis of a death rate of say 30 per 100,000, and with due allowance of normal seasonal variation, an excess of some two to three times the amount that would reasonably be expected.

Although this excess is marked, it can hardly be considered as approaching in any way an epidemic, nor is it so far appreciably in excess of the continued prevalence of this disease in a number of cities in this State. In other words, its prevalence in Camden is not such as to create alarm, but it is such as to indicate some apprehension. It indicates further that there is some influence at work that should be at once carefully looked into and that a course of rigid precaution against a further spread of the disease should be pursued.

My first inquiries were in regard to the water supply, and with reference to this question the Department was fortunate in having had made a special investigation by the Engineering Division of this supply and in having a report almost completed describing these works and the sanitary conditions on the watershed. The source of this supply is from springs, not subject to contamination, this spring supply being supplemented by water from Emmons brook, a tributary of the west branch of Fish creek. The watershed of this brook is about 1.5 square miles and has a resident population of about twenty persons. The locations of the dwellings of this population were found to be such that there was no direct pollution of this brook. It is evident, however, with some four or five houses on this small watershed that there must be indirect pollution and that contamination is always possible. That some pollution does reach this brook is indicated by the three analyses of the water made by the State Hygienic Laboratory during the year, two of which show the presence of the Colon bacillus.

It must, of course, not be inferred that this pollution necessarily indicates *typhoid infection* of the supply, for unless cases of typhoid fever have occurred on the watershed, either by pronounced cases or through bacillus carriers, this infection of the supply could not occur, and there would consequently be no reason to connect the present prevalence of the disease with the water supply. This information as to existence of any cases of fever on the watershed has, however, not yet been determined by the local board, but it should be determined without delay.

The question of uncooked food has not been thoroughly investigated by the board, but from present general knowledge there is little reason to place any great weight on these factors. The question of oysters, celery and other foods should, however, also be looked into more in detail by the board, not only as to the cases that have already appeared but especially in their study of all future cases.

The question of flies can hardly be considered a factor considering the fact that these typhoid fever cases have developed after the general decline of the fly season.

The next question considered was with respect to the dairies supplying milk to the village. Three of these dairies, Coates, Crimmins and Sanford, supply nearly the entire village with milk, each supplying approximately one-third of the total supply. This milk supply was considered to be the most important factor since it developed that all but two of the typhoid cases secured milk from one of these dairies, viz., the Sanford dairy. Although only one dairy was thus under suspicion, all three dairies were inspected as to location, sanitary conditions and methods of operation.

The Coates farm was found to be neat, the cattle well-housed and fed, and the drainage fairly satisfactory. The cans were alleged to be carefully cleaned and rinsed with boiling water. Although not a modern model dairy, there was nothing conspicuously lacking in the construction, sanitary surroundings and operations that would lead one to in any way condemn it, although, as might be expected, there were opportunities for general improvements.

The same remarks may likewise be made with reference to the Crimmins and the Sanford dairies. The Crimmins dairy in appearance and methods was, however, not up to the standard of either the Coates or the Sanford dairy.

Owing to the close association of the Sanford dairy with nearly all of the typhoid cases, a closer inspection and inquiry was made there. A pure, spring water supply and good facilities and apparently cleanly handling and cleaning of the cans was especially marked, and I discovered nothing in the general sanitary character of the farm and methods of operation to give any clue as to these features being the inciting cause of these cases of typhoid fever.

The apparent absence of any such inciting causes of infection at the Sanford dairy, and the persistent association of nearly everyone of these typhoid cases with this dairy, point strongly to a possibility that some one at the farm who handles the milk might be a bacillus carrier. The probability of a bacillus carrier at this farm based on the laws of chance is, of course, remote, but when we consider that the existing prevalence of this disease in Camden does not constitute an epidemic, and that whatever influence is at work is probably a subtle one, I am of the opinion that this question of bacillus carrier should be definitely settled. From my conversation with Mr. Sanford and his expressed feeling of coöperation and assistance in determining this matter for the benefit of himself and of the public welfare, I believe he will willingly consent to having the board secure the necessary samples for testing.

If the prevalence of typhoid fever in the village had been more pronounced, it might have been an easier matter to locate definitely the inciting cause or causes. In view of this relatively small number of cases spread over so long a period and the apparent obscurity as yet of any single focus of infection, I would recommend finally that the board continue their investigation along the lines suggested above and more in detail, especially as to the following:

1. The possibility of infection through use of uncooked foods such as celery, oysters and fruit.
2. Existence of any cases of typhoid fever upon the watershed of their water supply.
3. The possibility of infection or some cases through secondary or contact infection — especially in the cases of the three houses on the road near and below the Sanford dairy.

4. The possibility of presence of bacillus carriers at the Sanford farm.

I believe that the first three recommendations should be carried out before the matter of bacillus carrier on the Sanford farm is investigated; and that if the board finds it necessary to take up the question of "bacillus carrier," that this Department assist the local board to the extent of sending sample bottles for the collection of samples and in having the samples tested at either the Hygienic or Bender Laboratories. Should the results prove negative, the board should then continue its careful and individual investigation and scrutiny of every case that develops in the future, since it is only by such a course that it can be hoped to discover the true cause or causes of infection.

Respectfully yours,

THEODORE HORTON,
Chief Engineer

CLAYTON

ALBANY, N. Y., *October* 8, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR.— I beg to submit herewith a report of an investigation by the Engineering Division concerning an epidemic of sickness at Clayton, Jefferson county, and my conclusions and recommendations concerning the steps that should be taken by the village authorities to relieve the present situation.

For the purpose of making a sanitary survey of the conditions which exist at Clayton with respect to water supply, sewerage and other factors which may be associated with the cause of sickness, Assistant Engineer Cleveland was detailed to visit Clayton and I herewith transmit his report covering the results of his investigation. To supplement this report the results of analyses of the various samples of water collected by Mr. Cleveland have been submitted by the laboratory.

On October 5th the full analyses of the water samples described in the following report were completed and reported upon by the

Laboratory Division. The results of the analyses were as follows:

Sample No. 1 from St. Lawrence river over mouth of intake pipe.

Bacteria per cubic centimeter, 375.

Bacteria of B. Coli type, 10 c.c. inoculations, 2 + 0 –; 1 c.c. inoculations, 0 + 3 –; 1/10 c.c. inoculations, 0 + 3 –.

Sample No. 2 from St. Lawrence river over line of intake pipe for village water supply system, 100 feet off shore.

Bacteria per c.c., 500.

Bacteria of B. Coli type, 10 c.c. inoculations, 0 + 3 –; c.c. inoculations, 0 + 3 –; 1/10 c.c. inoculations, 0 + 3 –.

Sample No. 3 from tap in pumping plant of village water supply system.

Bacteria per c.c., 650.

Bacteria of B. Coli type, 10 c.c. inoculations, 0 + 3 –; c.c. inoculations, 1 + 2 –; 1/10 c.c. inoculations, 0 + 2 –.

Sample No. 4 from public water supply tap in office of Dr. H. J. Frame.

Bacteria per c.c., 375.

Bacteria of B. Coli type, 10 c.c. inoculations, 0 + 3 –; c.c. inoculations, 0 + 3 –; 1/10 c.c. inoculations, 0 + 3 –.

From the results of the analyses it will be seen that while the total bacteria count as noted in the several analyses is not excessive, these results of the tests for B. Coli confirm the evidence pointed out above that the river water is subject to contamination by either human or animal pollution. The very fact of the low bacterial count, coupled with the evidence of the presence of intestinal organisms, indicates contamination of a relatively virulent nature.

The fact that tests of the sample collected over the intake pipe line 100 feet off shore did not show the presence of B. Coli may be due to the chance of sampling or to a horizontal stratification of flow in the river which prevented pollution from passing in the thread of flow passing this point at the time of sampling. In all probability additional samples taken at this point would show contamination.

It is evident, then, that the results of analyses given above are not only in harmony but closely substantiate the evidence of pollution of the water supply clearly shown to be possible by the accompanying report of Mr. Cleveland. The distribution of cases and other factors brought out in the report of Mr. Cleveland concerning the milk supply seem to indicate clearly that the milk supply has had little, if any, association with the cause of the epidemic up to the time of the inspection. Other factors such as transmission through shellfish, raw vegetables, insects and other channels were found not to have any important relation to the cause and spread of the epidemic.

It is very significant in regard to the appearance of typhoid at Clayton that typhoid has been very prevalent at the village of Cape Vincent (located 16 miles above on the St. Lawrence) during the past few years, and the Department was called upon to investigate the unusual prevalence of typhoid at Cape Vincent during the past spring.

The source of the water supply and the manner in which it is secured is closely similar in its sanitary aspects to those at Clayton, both supplies being taken from the St. Lawrence through intakes extending a short distance from the southeast shore, the conditions at Clayton, however, being more serious on account of the contamination added to the river by the sewage from Cape Vincent and other points and owing to the possibly dangerous factor associated with the arrangement of local sewers and intake at Clayton.

A careful investigation was made by the Department last spring concerning the prevalence of typhoid at Cape Vincent and in my report to you and in a communication addressed by you to the village authorities it was pointed out clearly that the prevalence of typhoid fever at Cape Vincent was due to the infection carried down from the Black river and other points along the southeast shore of the St. Lawrence river and Lake Ontario.

Summarized briefly, the facts presented as to the discharge of sewage into the St. Lawrence river above Clayton; the fact that sewage contamination of the public water supply is confirmed by the results of the water analysis; the fact that the conditions at Clayton are closely similar to those at Cape Vincent where it was shown that the water supply was responsible for the undue prevalence of typhoid fever at that place; and finally, the fact that this prevalence of typhoid fever at Cape Vincent and other points in this vicinity must necessarily add a considerable amount of infection to the St. Lawrence river at points only short distances above Clayton, are in my opinion ample evidence to justify the conclusion that the water supply of Clayton is largely, if not wholly, responsible for the present epidemic of sickness and the prevalence of typhoid fever in Clayton.

I should, therefore, make the following recommendations regarding action which should be taken by the local board of health and the board of trustees:

1. That the previous warning which it was recommended to the board of health on September 27, 1909, should be given to the public to boil all water, should be strictly observed and continued until adequate and efficient means are adopted and carried out by the village authorities for furnishing a pure and safe water supply for the village by either securing a new raw supply from an unpolluted source or by efficient purification of their present supply.

2. That if after careful consideration of the various means of securing a pure supply it is considered expedient to purify the present supply taken from the St. Lawrence river, it is highly desirable, if not necessary, to change the arrangement of the present water supply intake and the main sewer outlet. Owing to the fact that the intake main is under a vacuum condition and that the outlet sewer is under a plenum condition, there will always be a menacing probability of an infection of water in the intake and as a consequence the outfall sewer should be carried to a new discharge point entirely away from the intake and at a point well down stream and all sewer outlets from the village above the intake should be intercepted and the sewage carried well below the intake.

3. That the local board of health and the practising physicians of the village take immediate steps to prevent a spread of the present disease through contact or other channels of infection by isolation of patients, careful disinfection of all stools from patients, screening against flies and carefully guarding against any infection of the milk supply. In the latter case visits and

careful inspections should be frequently made of all dairies supplying milk to the village, precautions should be taken to prevent milk bottles being left at houses where actual or suspected cases of typhoid fever exist and steps taken to suspend any dairy or milk route where suspicion of infection of the supply occurs until all danger of infection is past.

4. That in order to definitely determine the nature of any cases of disease, Widal tests be made in accordance with the previous recommendations of September 27th facilities for which were furnished at that time.

In connection with the above recommendations it may be well to suggest that a comparatively recent development in water purification has furnished a means of sterilization by the application of certain disinfectants in minute quantities sufficient to kill pathogenic bacteria and not to materially affect the potability of the supply. This method of sterilization has recently been applied in practice by the East Jersey Water Company for the supply of Jersey city, and whereas I am constrained to recommend this method as a permanent one for use at Clayton, the scientific results and efficiency of it lead me to believe that it may be applicable to the present conditions at Clayton as a temporary measure and until a permanent means of purification has been studied and adopted. I wish most strongly to point out, however, that a sterilization of water by this method should be attempted only under the most careful supervision and direction of a competent sanitary expert familiar with its application and after a study has been made of the present arrangement of the water supply system with respect to the possibility of installing quickly and temporarily the tanks, dosing devices and other appurtenances necessary to effect the sterilization of the supply.

I would further recommend that a copy of this report and the accompanying report of the inspection be transmitted to the board of health and the board of trustees of Clayton and that these boards be instructed to carry out the recommendations herein contained.

If the duties of the village boards are efficiently carried out in respect to all the provisions contained in the above recommendations and if the public faithfully heeds the warnings and instructions of these boards, it is my opinion that the present epidemic will speedily subside and a future recurrence of the disease will be prevented.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

ALBANY, N. Y., *October* 7, 1909.

THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— In accordance with your instructions I recently visited the village of Clayton, Jefferson county, for the purpose of making an investigation of sanitary conditions in the village with relation to the prevalence of typhoid fever in that village.

The investigation was made on September 25th and was undertaken as a result of information received at this Department concerning the existence of several cases of typhoid in the village together with considerable sickness epidemic in character.

The village of Clayton is situated on a peninsula on the southeast bank of the St. Lawrence river about eighteen miles below Lake Ontario, and just below the mouth of French creek, a small stream tributary to the St. Lawrence. The permanent population is about 2,000, which is increased in the summer to about 2,500 although through the summer season many thousand people from neighboring resorts and summer homes buy supplies or pass through the village, it being the terminus of the Clayton branch of the New York Central railroad.

The village is supplied by a public water supply system and has a public sewerage system; the sewers carrying both sanitary sewage, and storm surface water. Both the water supply and sewer systems were constructed in 1899, the pipes being laid in the same trenches on account of the fact that rock occurs over considerable area of the village. It was stated by the superintendent of streets that in general the water mains are laid four or five feet above the sewer pipes. The sewer system was constructed under plans approved by this Department on June 30, 1896.

The public water supply is pumped from the St. Lawrence river, a 12-inch intake pipe extending 600 feet into the river from the shore line, at which point the depth of the river is stated to be about sixty feet. The pumping machinery consists of two Dean horizontal duplex pumps having capacities of 750 and 800 gallons per minute, respectively. The water is pumped from 7 a. m. to 4 or 5 p. m. and the surplus over consumption is delivered to a standpipe on a knoll in the southerly section of the village. The intake line is paralleled for about seventy-five feet by the main outlet sewer which is laid about three feet down stream and slightly above the water intake pipe.

The milk supply is furnished principally by three dealers, D. C. Hollenbeck, Edwin Steele, and F. J. Carpenter. Mr. Hollenbeck supplies 50 or 60 gallons and has about 150 customers. He purchases some milk from M. J. Fitzgerald and some from James Gokey, the water supply on these farms being derived from drilled wells. Mr. Steel furnishes 200 gallons and supplies about 250 families; surplus milk over the production from his own farm being purchased from Elmer Kellogg. On Mr. Steele's farm, in one pasture a well in sandstone supplies the cattle. In another, the water is pumped from the river. In the barn, the village water supply is used. The farm of Mr. Steele lies down stream from the village. Mr. Carpenter supplies 70 to 80 families and purchases extra milk at the farm of Peter Graves. Village water is used on the Carpenter and Graves farms. Mr. Charles Steele supplies the Walton and Hubbard houses.

Milk left over from the daily routes of the dealers is occasionally sold to the milk shipping station. It was stated by the foreman at the station that no cans or utensils of milk dealers are ever washed or rinsed at the milk shipping station.

Some sickness has occurred in the families or among the help of some of the milkmen. A boy employed on Mr. Edwin Steele's delivery wagon since July 30th, was taken sick about September 12th, and although his case is not diagnosed as typhoid he has intestinal trouble and considerable fever. No Widal has been made.

A daughter of Mr. Charles Steele residing in Clayton, who visited his farm at times during the summer is now ill with typhoid.

Practically no oysters have been consumed in the village.

There have been during August and September over 100 cases of fever of some description, intestinal trouble, or gastritis, in the village. The sickness amounting to an epidemic which started the latter part of June.

There are four practicing physicians in the village. Two of these physicians have not diagnosed any of their cases as typhoid, although they state that many of the symptoms of typhoid, such as bowel trouble, rash and high temperature have appeared, yet no combination of symptoms in any one case has led them to diagnose the case as typhoid. One of these physicians at the beginning of the epidemic tried Widal tests in three cases which seemed typical of typhoid fever, but as the reports of the Widal were negative and the symptoms seemed to be similar in succeeding cases, no further Widal tests were made. One other physician has treated two cases of typhoid (cases 2 and 6 in the following table) while the fourth physician has treated cases 1, 3, 4 and 5, in the following table. Each of these two physicians has treated many other cases of fever of some sort, intestinal trouble, or gastritis, such cases resembling typhoid in some symptoms.

The following table gives the seven cases of illness which have been pronounced typhoid and which have occurred in August and September.

Case No	Age	Date of onset	Water supply	Milk supply	Remarks
1	4	Aug. 1	Village	Carpenter	
2	27	Aug. 2	Village	Private	
3	13	Aug. 11	Village in part	Hollenbeck and private	Case fatal.
4	9	Sept. 11	Village in part	Hollenbeck and private	
5	..	Sept. 10	Village	Own dairy	
6	17	Sept. 14	Village in part	Hollenbeck and private	Case fatal. Had been engineer on yacht.
7	22	Sept. 15	Village	Edwin Steele and Hollenbeck	

Respecting the pollution of the St. Lawrence river and the possible infection of the public water supply, it should be noted that the sewage from the city of Kingston, twenty miles above

Clayton is discharged into the river, although on the opposite side from Clayton. Further, the sewage from the village of Cape Vincent, sixteen miles above and on the same side of the river is discharged into the river. It is known that typhoid fever has occurred in Cape Vincent during the present season, and it is said that typhoid has been prevalent in Kingston during the summer. Further, several cases of typhoid have occurred on Wolf, or Long island in the farm houses and summer homes, and surface wash from this island reaches the American channel, while two private sewers in State and Union streets in the village of Clayton, serving two and five houses, respectively, discharge into the river. In one of these houses a definite case of typhoid has occurred and is included in the table. From many cottages along the southerly shore of the river above Clayton sewage is discharged into the river.

While owing to the swift current in the river, which is said to be approximately two miles per hour, the sewage discharge from the private sewers in the village of Clayton above the pumping plant might not reach the mouth of the intake which is 600 feet from the shore line, it was stated by several residents that when, during storms and spring floods, the water in French creek became roily, the water from taps in the village was roily, although the influence of the roily water from French creek could not be traced farther than from 300 to 400 feet from the shore line.

This would seem to indicate the possibility of a break in the intake pipe and the possible infection of the supply by pollution which exists near the shore line. Further, on the day of inspection under a northeast wind, a surface current of six or eight feet per minute up stream was noticed for a hundred feet or more from shore along the dock front of the village above the pumping station. This would tend to deflect into the middle currents of the river, any floating polluting matter.

It was stated by the superintendent of streets that in 1906 a diver was employed to examine the intake line, but that no breaks were found. In this connection it should be noted that at least once during the past season a freight steamer lying in the upper harbor at the village, drifted anchor under a southwest wind and passing down stream broke a telegraph cable laid across the river a few hundred feet up stream from the intake pipe. Since the intake line is laid on standards and maintained two or three feet above the river bottom it is reasonable to suppose that it may have been damaged by the drifting anchor of the freight steamer.

Samples of water for bacteriological analyses were collected on September 25, 1909, at the following points:

1. From St. Lawrence river over mouth of intake pipe for public water supply system.
2. From St. Lawrence river over line of intake pipe 100 feet off shore.
3. From tap in pumping plant of village water supply system.
4. From public water supply tap in office of Dr. H. J. Frame.

These samples were delivered at the laboratory on the same day and the analyses were started immediately.

In conclusion, I beg to call your attention to the following facts which stand out clearly with respect to their relation to the causation of the epidemic, viz., the evidence as to the discharge of sewage into the St. Lawrence river above Clayton; the recent prevalence of typhoid fever at Cape Vincent and other points along the river above Clayton from which pollution reaches the river; and the distribution of the cases of typhoid fever and other cases of intestinal ailment over the entire area of the village and among customers of several different milk dealers and private dairies.

Respectfully submitted,

H. B. CLEVELAND,
Principal Assistant Engineer

ALBANY, N. Y., *October* 12, 1909.

MR. HENRY S. BRESLOW, *President, Board of Health, Clayton, N. Y.:*

DEAR SIR:— I am inclosing herewith for the consideration of the board of health of the village of Clayton and for the guidance of the board in suppressing the present epidemic of sickness in Clayton, the reports of Chief Engineer Theodore Horton and

Principal Assistant Engineer H. B. Cleveland covering an investigation of the conditions relating to the prevalence of typhoid and other cases of intestinal ailment in the village and containing recommendations for action to be taken by your board and by the board of trustees in suppressing as far as possible the present epidemic and preventing a future recurrence of typhoid in the village.

I beg to state that I fully concur in the conclusions and recommendations of these reports and trust that the action recommended will be at once taken by your board and by the board of trustees to whom copies of the inclosed reports are this day transmitted.

I would further suggest that your board cause the publication of the inclosed reports in the local newspapers in order that the public may be fully informed of the situation and may, therefore, more readily and intelligently assist the village authorities in preventing a spread of the present sickness and in insuring against its recurrence.

Kindly furnish me with a copy of the paper in which the inclosed reports are published and inform me as to the further action taken by your board and the board of trustees.

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

ALBANY, N. Y., *October* 12, 1909.

President of the Village, Clayton, N. Y.:

DEAR SIR:— I am inclosing herewith for your consideration and for the guidance of the board of trustees of the village of Clayton the reports of Chief Engineer Theodore Horton and Principal Assistant Engineer H. B. Cleveland covering an investigation of the conditions relating to the prevalence of typhoid and the epidemic of sickness in Clayton and containing recommendations for action to be taken by your board and the board of health in suppressing as far as possible the present epidemic and preventing a future recurrence of typhoid in the village.

I beg to state that I fully concur with the recommendations contained therein as to action which should at once be taken by your board and by the board of health not only in suppressing the present epidemic but in guarding against a recurrence of typhoid fever in the future.

Copies of the inclosed reports have been transmitted to the board of health of the village of Clayton with the request that such board take the steps recommended as far as lies within their power and that they cause the publication of the inclosed reports in the local newspapers in order that co-operation by the public may be secured and I trust that your board of trustees will immediately follow out the recommendations made and inform me of the action taken.

Very respectfully,
EUGENE H. PORTER,
Commissioner of Health

COOPERSTOWN

ALBANY, N. Y., *January* 6, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR: — In accordance with your directions and pursuant to the request of the local health officer, I visited Cooperstown to consult with and advise the local board in reference to the recent outbreak of typhoid fever in that village.

I reached Cooperstown on Sunday, January 3d, at noon, and in the afternoon had a conference with Dr. Moon, health officer, Mr. Tucker, president, and Mr. Vandewerker, secretary, of the village board of health. I heard from them an account of the development of the epidemic and the investigations they had made; an account of the appearance of the individual cases and the information they had secured in reference to each that would throw light on the causes of the outbreak; and the precautionary and corrective measures they so far had taken to stop the epidemic. I then gave them general and specific advice as to further search for information to determine definitely the cause of the outbreak and of the measures they should instigate to prevent any further spread of the disease. On Monday I personally made an investigation of the conditions surrounding the water supply in order to confirm or eliminate this factor as a cause of the epidemic and of the International Milk Product Company, which thus far has been under suspicion.

The records of the cases show that about December 10th the first case was reported, and by the 15th some seven or eight cases had been reported. From about the 15th or 18th to January 1st other cases have appeared successively, until on January 3d some twenty-five cases had been reported.

Of the twenty-five cases reported, some fifteen are among children ranging from six to fifteen years of age, the remainder being among adults. Of these twenty-five cases, again, twenty have used milk regularly from one source, the International Milk Product Company, and three of the remaining five had used milk from this source within a few weeks prior to illness. Practically all of the cases use the public water supply. About one-half the cases have eaten oysters prior to sickness, but only one-half of them ate them raw. No other uncooked food supply was found to be eaten by a considerable number of those stricken.

From the fact that some twenty-three out of twenty-five reported cases used the same milk supply prior to illness, and that a large percentage of the cases were among children, the evidence pointed at once to the fact that the epidemic was a milk epidemic and that this common milk supply was the probable cause of it. This evidence was not considered conclusive, however, for it was found that the International Milk Product Company supplies about three-fifths of the community with milk, and there was, of course, a remote possibility that the use of milk by practically all of the victims might have been more a coincidence than an exciting cause of the infection.

The oysters were at once eliminated as a cause from the scant evidence presented. Likewise, vegetables were eliminated, since it was found that the only suspicious source was celery which had been considerably peddled from the street preceding the epidemic, and this source after investigation was not found to show any probability of contamination.

This left the water supply as the only reasonable source to be considered outside of the milk supply, and, knowing certain undesirable conditions in regard to the intake works that might under certain conditions be a menace to the purity of the water in this village, I made an individual inspection of it.

The supply is taken from Otsego lake through an intake pipe extending some 1,500 feet north of outlet, and is carried through an intake pipe leading from the intake crib in the lake along bed of lake and the Susquehanna river some one-half mile below outlet to the pump well and pumping station located beside the river. On this pipe line at a few places along the river are placed air valves for the release of any air that may accumulate.

It happens that along the same section of the river below the lake outlet and in places in proximity to this water pipe line, is laid a sewer composed of iron and tile pipe, the pipe being laid along the bank of the river but in places on the bed itself, where it is exposed under water. This sewer serves a considerable portion of the population of the village. It is evident at once, then, that the security against contamination of the water supply carried in one pipe line, by the sewage carried in another pipe line laid near it and exposed in places, will depend entirely upon the relative condition of hydraulic pressures in the two mains and the possibility of leakage in both lines or of any overflowing from the sewer line into the river.

To determine so far as practicable whether the supply could become infected through these conditions of the intake works, or from other sources, I made a careful inspection of these sources and of the intake works from the lake to and including the suction well and pumping station. There was found to be no conditions surrounding the intake itself, in the lake, that would, except by most unusual conditions, cause any appreciable contamination. Likewise, I find nothing at the pumping station or pump well to lend any suspicion to these as factors.

As to the condition of this intake pipe along the river where the two pipe lines, one carrying sewage and one the water supply, run in close proximity, both being uncovered in places and exposed though submerged, upon the bed of the river, I find, first, that the sewer is laid along the west bank of river from opposite the lake outlet to the pumping station, and that at two places, one just below the Main street bridge for a distance of some twenty-five feet, and one above the water works for a distance of some 300 feet, the pipe is exposed upon the river bed. This sewer is, with the exception of about 200 feet just above the pumping station, composed of cast iron, whereas the 200 feet referred to are composed of tile. At frequent intervals along the river there are lampholes extending perhaps ten feet above the invert. At one place, however, just below Main street bridge there is an overflow pipe at an elevation of possibly six feet above invert and at about, or slightly above, mean water level in the river, which at times may overflow. These times occur during storms when roof water carried in sewers surcharges it, and at times of high water in river when the sewage backs up from the submerged outlet. During these times the river water is manifestly contaminated. During the past few months, however, I was informed that the occurrence of rains and possible surcharge of sewer, or high water in the river, had not occurred to cause this overflowing of sewage. At other times than these it is evident that any leakage whatever must be *into* the sewer and not out of it, so that there would be no pollution of river from this source.

As to the water intake line, this was found exposed upon bed of river for its whole length from intake to pumping station. It is a 14-inch cast iron bell-jointed pipe and is provided with twelve air cocks for release of entrained air. During pumping of water any leakage in this pipe at joints or open valves would permit river water to enter it, which might thus contaminate the supply. It is claimed that this pipe is perfectly tight and that valves are always kept closed except when air is released. It was impossible to determine these facts during my visit, but it would be possible to determine this leakage by shutting the valve at the intake end and pump down the water in the pump well. The leakage would then be at once apparent. This should be done in order to settle this possibility of contamination.

It may be true that during the past few months the conditions were such that contamination from this source was improbable. It is true also that this supply was recently analyzed by the Department and found free from sewage pollution. This does not alter the fact that occasional contamination may take place and possibly has taken place in the past, if this line has not been absolutely tight and no air valves have been left open.

Another fact which should not be passed over in this connection is that the southern shore of lake as well as banks of the river below the outlet is subject to some local pollution outside of the sewer. Willow brook we know to be polluted, and this as well as other pollution will drift naturally along shore and into the river and tend to cause a continuous pollution of the river water. There is a remote possibility also that this pollution in time of heavy winds might reach out into the lake to the intake.

It is evident from what has so far been said that, barring the remote possibility of intermittent contamination of the water supply through the intake works, and especially in view of the lack of pollution at the times when samples were recently collected and analyzed by the State Department of Health, all reasonable suspicion as to the cause of this outbreak is upon the milk supply of the International Milk Product Company. So far, however, no positive evidence as to the cause of infection of this supply has been determined by the board of health. Unfortunately, this supply is a composite one derived from a large number of farms covering a large territory mainly tributary to the trolley line from Oneonta to Herkimer. The board has so far made only an investigation of certain alleged cases of possible pollution from dairies tributary to the International Company located along the Susquehanna river below Cooperstown, where it has been claimed that, owing to drought, the owners have used water from the polluted river for their cattle and dairy purposes, using the milk cans for conveying the water. This is a possible source, if the facts are substantiated, although no conclusive evidence could be obtained by the board during a careful inspection. This factor is being further investigated.

I personally, in company with Dr. Moon, inspected the milk station of the International Milk Product Company, questioned the manager and inspected the plant, and learned that some 15,000 quarts of milk are received and shipped from here to New York City. Only 300 or 400 quarts are sold to some 1,500 people of Cooperstown. Sterilization was alleged to be practiced fair by steaming for one-half hour in case of bottles, but I found that the cans were not sterilized any more than would occur from a few seconds' exposure of steam to the interior of each can. I was informed that 200 or more dairies supply milk and that weekly reports are sent in by each dairy in accordance with New York City Board of Health rules, stating among other things the occurrence of any infectious diseases.

Outside of these voluntary reports, no inspections within a month were known to have been made by the New York City board of this milk company for the purpose of verifying these reports. The manager frankly admitted that the Cooperstown supply was not a factor of interest in their business and that they did not especially concern themselves with it.

The superintendent stated that the dairies below Cooperstown along river had been shut off since epidemic started. He stated that he could not confirm rumors as to these dairies using river water and hauling the same in their milk cans, but it is a significant fact that the company shut off these dairies, especially in view of the professed indifference to the situation in Cooperstown. Again, there were numerous "weekly reports" from dairies not submitted recently, and it is barely possible that the reason may be owing to the existence of contagious diseases at such dairies. In other words, much verification of facts needs to be done in respect to these dairies supplying this company.

The largest portion of the territory in which are located the dairies which supply milk to the International Milk Product Company has not been canvassed by the Board, and I urged that a careful canvass of this territory be made at once. I suggested that the Board appoint an inspector for this purpose at once, and, if necessary, secure the services of an experienced sanitary expert. In either case, I advised that a detailed canvass be made to find out any dairy which has upon it now or has had within two months a case of typhoid fever, and, if such were found, to take immediate steps to shut off this supply until all danger therefrom is removed.

The Board has already sent out special warning notices to the public to boil both water and milk, and I was advised by them that all necessary precautions, were being taken in matters of disinfection and other sanitary precautions in the hospitals and sick rooms. I emphasized the need of these precautions and of a continuation of all these measures until the inciting cause of the epidemic is found and removed.

I believe that, if the recommendations made to the board are carried out faithfully, especially the further investigation of the milk supply and the elimination of any infection that may be discovered, and if the precautions already taken by the board to have the public boil water and milk are continued until the inciting cause of this epidemic is found and removed, this epidemic will soon be brought to a close. The success of these measures will depend, however, largely upon the attention paid to details, and, so far as I could observe, the board and its health officer are striving to leave no stones unturned.

Aside from the consideration of the present serious situation, I believe that the attention of the board and the village authorities should be called to two important undesirable features that exist in the village, with reference to both the water supply and sewerage. One is the possible menace to the water supply due to the proximity of the location of the sewer and intake water supply main in the river, the resulting serious trouble depending entirely upon the frequency and intensity of pollution of the river and the possibility of leakage into the intake supply mains. The other is the introduction of purification of sewage as recommended to the village in a communication from you dated July 16, 1908, written incident to our investigation of the sanitary condition of the mill pond above Colliers. These two factors have an important bearing upon the health of the village and should receive their attention and consideration without delay, and I recommend that a copy of this report be accordingly sent to the village board of health in order that any additional facts relating to the present epidemic stated herein may be conveyed to them, and that they be thus advised of these recommendations with regard to the intake works of the water supply and the question of improved sewerage and sewage disposal. These matters should be taken up by them with the village trustees with the view of having them attended to without delay.

I wish, finally, to recommend that the New York City Bo
of Health be advised of the facts so far ascertained with

to recorded cases of typhoid fever in Cooperstown with respect to the International Milk Product Company in order that they may investigate on their own account and interest the possibility of infection of this supply.

Respectfully yours,

THEODORE HORTON,
Chief Engineer

RICHMONDVILLE

ALBANY, N. Y., *April* 29, 1909.

MR. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— I beg to report on an investigation of a typhoid fever epidemic in the village of Richmondville. This investigation was made on April 27th, in response to a telephone message from Dr. M. F. Shafer, the health officer, asking that the assistance of this Department be given the local board of health in investigating and controlling the epidemic.

Richmondville is an incorporated village in the western portion of Schoharie county on the headwaters of Cobleskill creek. The population is slightly under 600. The village is chiefly residential and is a trading point for the nearby farming district.

There are no public sewers in the village, although along the small stream which passes through the center of the village and discharges into Cobleskill creek sewers from the two hotels and ten or twelve private residences discharge.

A public water supply was installed in 1894. The supply is taken from spring-fed streams which are impounded in a small reservoir about three miles west of the village, at an elevation of some 220 feet above the main portion of the village. The drainage area tributary to the reservoir is only one or two square miles in area and there are at present eight farm dwellings on this area. The sanitary condition at these points will be described later.

The milk supply for the village is furnished principally by one dealer operating his own dairy, the surplus from which, over that *distributed* in the village, being sold to the milk shipping station.

There are four or five other persons who supply milk, keeping from one to three cows but have no wagon delivery.

Dealer No. 1 supplies 80 per cent to 85 per cent. of the residents; No. 2 supplies 8 per cent. or 10 per cent., while three or four others supply four to six families each.

The total number of cases to date has been fifteen. The dates of incidence (taking bed) are as follows:

March 15	1	April 20	1
April 10	1	April 21	1
April 12	3	April 22	1
April 15	1	April 25	2
April 17	1	April 26	2
April 19	1		
		Total	15

Milk dealer No. 1, supplying probably 85 per cent of the residents, produces milk on his own farm, which was found to be in sanitary condition throughout. What washing of the utensils is done on the premises is with village water heated in an ordinary hot water tank. This dealer supplies about 100 customers and eight of the cases were supplied with milk by him. Six of these cases used village water entirely and the other two in part. The milk is distributed in 40-quart cans; no bottles are used, the milk being dipped from the cans into the receptacles provided by the customers. As stated, the surplus is taken to the shipping station and a contract is made with the proprietors of the shipping station whereby the four cans are washed and steamed at the station and immediately taken away.

There are forty-seven other farmers who sell milk to the shipping station. The cans are washed in a common tub and a platform is arranged with two steam pipes coming up under and flush with the platform, over which all cans are said to be placed and steam turned on for a short time after washing. It was stated that it has not been the practice to leave the dipper in the cans of milk dealer No. 1 when the cans were steamed for sterilization, but the foreman at the plant agreed to do so hereafter and to give especial attention to the steaming of the cans from t dealer.

There have been no cases of typhoid fever on the farm of dealer No. 1 and no recent instances of any fever or grippe in his family or any of his farmhands. A well on the premises is sometimes used in the summer, but has not been used at all for six months.

Dealer No. 2 supplies ten families, about 8 per cent. of the inhabitants, and there has been no sickness in this family. One of the cases has used his milk and used village water.

Dealer No. 3 supplies but three families. Two of the cases of typhoid fever have occurred among his customers, village water being used in both instances.

Dealer No. 4 supplies one hotel only, two cases having occurred at this hotel, although one is finally diagnosed as not being typhoid. Village water is supplied this hotel.

Another dealer supplies five or six families but no cases have occurred among his customers.

The proprietors of the shipping plant require weekly reports from all of the farmers selling milk to them, on blanks furnished by the New York city health department. In the report all cases of infectious diseases existing in the family or among the farmhands are supposed to be reported. The superintendent of the shipping station stated that no reports of typhoid had been made since December, when two cases were reported, one in the family of a farmer near the village who delivered all his milk and does at the present time to the shipping station, and one in the family of a farmer outside of the village, who then and now delivers all his milk to the shipping station. In this latter family, there is now a second case of typhoid fever, developed within a few days, but not as yet reported to the shipping station.

As stated, there are eight farm dwellings on the watershed tributary to the reservoir. No cases of typhoid fever could be learned of as occurring recently or in former years on any of these places on inquiry from each of the families, although several instances of grippe have occurred this spring. At one point, on the Allen farm, there have been two cases of grippe since April 6, but there is a very remote possibility of washings from the outside privies reaching the stream. On the Van Allen farm there has been no recent sickness, and the outside privy is so located that little possibility of pollution of the water in the stream exists. A barnyard on this farm, however, slopes toward and borders on the stream and these premises should be given attention.

On the A. B. Smith farm the outside privy is located fifteen feet from the stream at the edge of a steep terrace, so that the contents with any surface flow or leaching whatever would pass directly into the stream. Mr. Smith had grippe about March 15, accompanied by considerable headache. Arrangements were made at this point for the village authorities, with Mr. Smith's consent, to remove the privy to a point some distance from the stream. Mr. Andrew Smith, on another farm, had a slight attack of grippe the latter part of March. No special danger of washings from the privy polluting the stream exists, although it is located at the head of a shallow ravine.

On the Morris Powers farm two cases of grippe have developed within the past two weeks. The privy is located on the brink of a steep bank at the foot of which is a swamp draining into the stream. Arrangements were also made at this point for moving the privy to a safer location.

On the farm of Ervin Brooker, the privy is located 800 or 1,000 feet from the stream which lies at the foot of a hill, but owing to the opportunity for surface wash, and the steepness of the slopes, some danger of contamination of the stream in the early spring exists. The family moved to this farm on February 1, and in the latter part of February the daughter working on a nearby farm came home and was confined to the house for three weeks and confined to the bed for three or four days. She had high fever and headache, no rash, no bowel difficulty, but had considerable kidney trouble. All of the family, including the daughter, used an outside privy so constructed and located that surface wash over frozen ground would undoubtedly carry fecal matter to the stream.

On the farm of Merwin Brooker no sickness has occurred, and though barnyard drainage may perhaps reach the stream, the drainage from the outside privy vault must pass in a different direction and through woodland. The privies on all of these eight farms are of the common type without boxes.

Five of the cases in the village are school children, and two the possible cases are teachers in the public school, now that town. There are six teachers and 140 pupils in the school. The school building was found to be in excellent sanitary condition. The drinking fountains are not supplied with cups; a jet runs continuously overflowing a fixed cup.

In one of the other families there are children in attendance at the school.

The one oyster and clam dealer in the village has sold clams up to the present, but has received no shipment of oysters since March 15. Seven of the cases have not partaken of clams or oysters, and it is only probable that the other cases have had either clams or oysters for food during the winter.

A chemical and bacteriological examination of the water made by the Hygienic Laboratory of this Department of samples collected on March 19 showed the supply at the time of sampling to be of fair sanitary quality, although bacilli of the colon type were found in 10 cc sample, and the chlorine content was .87 parts per million as compared to a normal of .45 for this district.

These cases are fairly well distributed over all sections of the village.

The village meat market is supplied principally from a slaughter house northwest of and at some distance from the center of the village. No cases of sickness, except a recent case of grippe (within two weeks) has occurred among the firm and employees.

Perhaps 90 per cent. or 95 per cent. of the residents are supplied with village water. Owing principally to the clay formation over considerable areas of the village, and the consequent difficulty of maintaining cesspools, not over 20 per cent. or 25 per cent. of the houses have inside flush closets. Many such drains, however, discharge into cesspools and owing to the character of the soil at many points insanitary conditions result due to overflowing of cesspools.

In general, the sanitary condition of the village streets and private premises is good, although at several points action should be taken by the board of health to improve such conditions. A very evident need exists for a modern sanitary sewer system and the matter should be given earnest and immediate attention by the board of health and the village trustees.

CONCLUSIONS

While the cause of the present epidemic can not be definitely assumed, it seems very probable that infection of the public water supply may have been responsible for the outbreak. The absence of any positive information as to cases of typhoid fever on the watershed does not by any means eliminate the possibility of an infection of the water supply when it is considered:

1. That many mild cases of typhoid or paratyphoid may not be recognized as such;

2. That several cases of grippe together with one other case of physical ailment have occurred on the shed during February, March and April;

3. That at least three outside privies are and have been within a few days so located that their contents might be washed into the streams tributary to the reservoir, especially during the prevalence of spring flood conditions.

The spread of the disease through the use of infected ice or through the agency of flies need not be considered at this season of the year. Owing to the fact that only six positive cases and two possible cases of a total of fifteen were supplied with milk by one dealer (who supplied a much greater proportion of the total number of inhabitants) and that at least six of the other cases were supplied by other more or less private milk dealers, it is not likely that infected milk caused the outbreak.

Some of the cases, especially among the school children, may have been due to secondary infection.

RECOMMENDATIONS

I recommend that the village authorities be advised:

1. To take immediate steps to remove, disinfect and bury all excremental matter from the privies on the farms of A. B. Smith, Morris Powers and Ervin Brooker, and to arrange at once for changing the location of these privies so that their contents may not be washed into the stream during storms.

2. That strict sanitary precautions, including disinfection, be continued at all premises where typhoid fever has occurred.

3. That supervision of the vending of milk and of the thorough sterilization of all utensils be maintained by the village board of

health with the coöperation of the milk dealers and the officers at the shipping plant, in order to prevent any spread of the disease by secondary infection.

4. That notices be printed and distributed to all families in the village strongly urging that all village water be boiled before being used for potable and household purposes.

Respectfully submitted,

H. B. CLEVELAND,
Principal Assistant Engineer

ADDITIONAL INVESTIGATIONS RELATING TO TYPHOID FEVER

What may be termed outbreaks of typhoid fever with an unusual abundance of cases have also occurred at the following places and investigations have been made in most cases in connection with an investigation of the public water supply:

Cape Vincent,
Corning,
Elmira,
Ithaca,
Jamestown,
Moravia,
Walden.

INVESTIGATION OF COMPLAINTS RELATING TO STREAM POLLUTION

INVESTIGATION OF COMPLAINTS RELATING TO STREAM POLLUTION

The subject of stream pollution is one the importance of which cannot be overstated or too often stated. Whether it arises in connection with our upland streams and the farms adjoining them or with our mountain lakes the shores of which are dotted with summer camps and cottages, or with our larger rivers with their adjacent municipalities and industrial establishments, the need for reform continues, indeed must continue until an enlightened sense of sanitary duty, if not decency, prevails, and these once pure waters are returned to something approaching their original purity.

It is needless to say that the efforts of the Engineering Division devoted to this arduous and ofttimes hopeless task constitutes one of the most important duties entrusted to it or imposed upon it by the Public Health Law. Much has been accomplished, it is true, during the short time this Engineering Division has been in existence and especially in view of the limited funds and resources with which it has been provided; but much more must be accomplished in the future if real progress is to be made in the protection of our water supplies and suppression of insanitary conditions which have until recently been allowed to continue more or less unchecked.

The work of the Engineering Division in this field of practical and applied sanitation is so varied and complex in its nature that a sub-classification of it is hardly possible. Nuisances caused by the discharge of sewage from municipalities and factories, overflow from cesspools and vaults and garbage dumped along the banks of streams are among the many cases complained of to the Department which call for inspections, investigations, reports and official action. Only the more important of these cases which have received the attention of the Department during the past year will be described in the following pages.

CANAAN

ALBANY, N. Y., *January* 20, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of an investigation of an alleged nuisance at Canaan, N. Y., caused by the lowering of the water level of Queechy lake.

On December 24, 1908, Mr. C. F. Breitzke, inspecting engineer of this Department, visited Canaan and called on Mr. Esek Finch of the local board of health. Accompanied by him he drove around Queechy lake and took note of conditions and instances of pollution.

Queechy lake is a natural lake, the water level of which was raised about five feet a great many years ago by the construction of a dam on Stony Kill at a point about one-fourth mile below the outlet of the original lake, for the purpose of storing water to supply several mills located along the stream below it. This added a long narrow arm of shallow water to the lake.

The original mills with the exception of one paper mill, which is said to have acquired all the rights of the others, have all disappeared. During the past summer, owing to the extended dry period, this mill not only used up all the stored water, but also lowered the level of the original body of water by excavating the bed of Stony Kill, leaving exposed at the lower end of the lake a muddy surface which was offensive to sight and smell.

Queechy lake has become a summer resort. The pollution entering it, however, with the exception of one case, is slight. Most of the cottages have privies and throw their wash water on the ground. About one-fourth mile north of the dam, however, there is one large summer boarding house with a capacity for fifty guests, run by Mr. William L. Speed, who is reported to maintain a sewer drain discharging into the lake. This sewage is doubtless largely to blame for the offensive odors connected with the exposed mud flats referred to above.

It is evident then that the only adequate and lasting means for *the improvement of the sanitary conditions surrounding Queechy lake is —*

1. By maintaining the water of the lake at practically a constant level, thereby preventing an intermittent covering and exposure of swamp areas which produce unsightliness and at certain seasons objectionable odors.

2. By removing the sewage now discharged into the lake from cottages around the shores, and especially from the hotel, which tends to increase the nuisance produced by exposure of swamp areas and to cause directly a menace to health through a deposition of this probably infected sewage upon and along the shores of the lake through agencies of flies or direct contact.

The question of riparian ownership and rights of persons who reside along shores of this lake, or of the rights of the mill owners below to draw down the water level, is a matter which is not within the province or jurisdiction of this Department. The commissioner has not the power under the Public Health Law to control the operation of outlet works to the lake, and I would suggest that the board and property owners take the matter up co-operatively with the mill owners, or independently through proper legal channels.

The board has, however, full power under the law to remove pollution from the lake, and I would suggest and urge upon its members the consideration of such measures as will bring about this removal. This removal of pollution will be an important improvement in itself and aside from question of water levels of lake, and should be taken up regardless of the question of lake level regulations.

Very respectfully,

THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *January* 25, 1909.

Mr. JAMES FINNEY, *President Board of Health, Town of Canaan, East Chatham, N. Y. (R. F. D.)*:

DEAR SIR:— Replying further to your letter of November 12, 1908, concerning the insanitary conditions surrounding Queechy lake, I am inclosing herewith a copy of the report of our Chief

Engineer covering his investigation of this matter. The report meets with my approval, and I trust that your board will give the conclusions and recommendations contained therein immediate and careful consideration.

You will note from this report that the improvement of the sanitary conditions surrounding Queechy lake, can only be effectively and permanently accomplished by following out two procedures; one by maintaining the water in the lake at practically a constant level; and the other by removing the pollution caused by the discharge of sewage into the lake.

In regard to the first measure, you will note that the matter of the rights of the mill owners to draw down the water level is one which is not within the province or jurisdiction of this Department, and of course can only be adjusted by taking it up directly with the mill owners or by resorting to proper legal measures.

In regard to the second, however, that of preventing further discharge of sewage into Queechy lake, that matter is entirely within the jurisdiction of your board which has full power under the law to remove pollution from the lake. I would, therefore, recommend that your board take up this matter independent of the question of water levels of the lake and do all that is within your power to remove the pollution.

Assuring you that this Department stands ready to assist you in this matter as far as is possible, I am,

Very respectfully,

EUGENE H. PORTER,
Commissioner of Health

CHADWICKS

ALBANY, N. Y., *February* 4, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to report that on January 27th an investigation was made of the complaint of the health officer of the town of New Hartford, Oneida county, of a nuisance in the village of

Chadwicks by the discharge of tannery wastes into Sauquoit creek; also to look into the location of a proposed tannery to be built in the village of New Hartford.

On January 27th, Mr. C. A. Holmquist, assistant engineer, in company with Dr. A. P. Clark, health officer of the town of New Hartford, drove out to and inspected the tannery, which is known as the Beckwith Leather Company, and is located in the village of Chadwicks on Sauquoit creek, two miles south of New Hartford and about five miles south of Utica. Several business and professional men were consulted on the way concerning the alleged nuisance, and they all agreed in the general statements that the tannery periodically discharges into the creek large quantities of foul smelling wastes which cover the surface of the water with thick white scum, and that in warm weather the odors become very offensive.

The Beckwith Leather Company make up colt and horse hides into what is known as patent leather. The manager stated that 150 men are employed and that about 1,000 hides are tanned per day by what is known as the chrome process as distinguished from the nonacid or hemlock bark process.

It was stated that from 3,000 to 4,000 gallons of water is used per day together with the following chemicals and compounds: 800 pounds of lime; 150 pounds of sodium sulphite; 300 pounds of sulphuric acid; 400 pounds of chrome atom; 150 pounds of soda; ½ bushel of hen manure; a large quantity of common salt.

Most of the wastes from the tannery, including the sanitary sewage from the closets, flow over the surface of the ground directly into the creek, except the wastes from the bating room which go into a cesspool located on the bank of the creek. This cesspool has a surface area of about 150 square feet and said to be from six to eight feet deep. At the time of inspection it was nearly full with a milky liquid. Its contents are discharged twice a week into the creek and would tend to confirm the validity of the alleged periodic discharges of foul wastes complained of by the men interviewed.

The hair from the hides is washed, baled and sold, and the fleshings, which contain a large percentage of fats, are sold to soap factories, so that a comparatively small amount of hair and fats reach the creek in the form of wastes.

On the day of inspection the tannery was operating at less than one-half of its normal capacity and the weather was cold so that there was comparatively little odor in and around the buildings, although the ground under the buildings and between them and the creek was saturated with sewage and wastes as it ran over the ground to the creek from three or four outlets. The water in the creek was unusually high, there having been several days of thaw and rain up to the day of inspection, so that the sewage and wastes from the tannery seemed to add but little discoloration to the stream already polluted by wastes from mills above.

While it is evident from the above that, at the time of the inspection, conditions were such as to minimize the nuisance, in warm weather with the tannery operating at full force, the discharge of a large amount of untreated putrescible matter, especially at the time of emptying the cesspool, into a creek that dwindles down to a very small stream during the dry season will create a very objectionable nuisance and should not be allowed.

The elevation of the floors of the tannery is about fifteen feet above the general level of the creek, and the buildings are far enough back from the creek to afford ample facilities for the installation of a settling tank. Settling tank treatment will undoubtedly do a great deal to abate the nuisance complained of by taking out a large percentage of the solids in suspension until more complete purification shall be required.

I, therefore, recommend that the Beckwith Leather Company be requested to concentrate all their sewage and wastes and convey the same through a closed pipe to a settling tank and to submit plans for a settling tank adequate to satisfactorily treat all their sewage and wastes and produce a non-putrescible effluent.

In regard to the proposed tannery, I beg to report that Kawolsky Brothers located at 87½ Whitesboro street, Utica, have purchased about three-quarters of an acre of land within the corporation limits of New Hartford along Sauquoit creek and about 150 feet south of Genesee street and directly adjoining George Hammer's residence. Ground had been broken at the time of the inspection, and fifteen small brick piers had been erected to support a building approximately 45 x 50 feet. This structure will be located about fifty feet back of Mr. Hammer's house.

There seems to be a great deal of objection to the building of this proposed tannery within the limits of the village and so close to the main thoroughfare. The health officers said he had received numerous complaints from property owners in the immediate vicinity. The inspector interviewed two of the complainants, namely, C. O. Jones, president of the village, and S. F. Sherman, owner of a canning factory. Dr. Clark also stated that the "concern had been moved from place to place because of creating a nuisance."

In accordance with chapter 468 of the Public Health Laws of 1903 and the policy of the Department governing the Mohawk river watershed " prohibiting entirely the discharge of any additional unpurified sewage or industrial wastes into these waters," I recommend that Kawolsky Brothers be notified as to what is the attitude of the Department, and that they be advised to submit plans for a disposal plant for the approval of the Department or to submit plans for a sewer extension to connect with the present sewer on Genesee street.

In this connection I beg to state that plans for a complete sewer system and disposal plant for the village of New Hartford were approved by the Department in January, 1902. The sewers were constructed according to the plans except the last 300 or 400 feet of the system which flows in an open ditch through a field to the creek. The disposal plant, however, has not been constructed although Dr. Clark, health officer, and Mr. C. O. Jones, president of the village, stated that funds have been set aside for the erection of the disposal plant but have not been used on account of the excessive price asked for a site. Dr. Clark also stated that decaying animal and vegetable matter covered the surface of the water of the coves near the confluence of the open ditch sewer outlet and the creek during the dry season last summer.

In view of the above facts and in accordance with the health laws and general policy referred to above, which further recommends " the removal of all existing pollution from domestic sewage and trades wastes by the installation of such methods of sewage purification as will remove as far as practicable all matter of a dangerous or objectionable nature," I recommend that the board of trustees be consulted and urged to construct the disposal plant at once.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *February* 25, 1909.

KAWOLSKY BROTHERS, 87½ *Whitesboro Street, Utica, N. Y.:*

DEAR SIR:— Since I am advised on responsible authority that you have proposed building a plant involving tanning operations in the village of New Hartford, I beg to call your attention to section 75, chapter 468 of the Laws of 1903, which reads as follows:

"No person, corporation or municipality, shall place or cause to be placed, or discharged into any of the waters of this state, unless the same shall have been permitted by the state commissioner of health, any sewage, garbage, offal, dead animal, dead fish, dead bird or part thereof, or any decomposable or putrescible matter of any kind or any substance, chemical or otherwise, containing the same in quantities injurious to the public health, or any refuse or waste matter, either solid or liquid, in quantities injurious to the public health, from any shop, factory, mill or industrial establishment; unless express permission to do so shall have been first given in writing by the state commissioner of health as provided in this article, etc."

The law further provides as follows:

"The penalty for the discharge of refuse waste matter from any shop, factory, mill or industrial establishment for which a permit is required by this act, without such permit shall be $100.00 and $10.00 per day for each day the offense is maintained."

I, therefore, suggest that, before any wastes or sewage is discharged into Sauquoit creek, you prepare complete plans for a satisfactory method of treating the sewage and wastes and submit *the same* for the approval of this Department.

I am enclosing a blank application for permission to discharge refuse or waste matter. On the return of this application properly filled out, accompanied by plans for preliminary treatment of wastes, from your proposed plant, by passing the same through a settling tank so arranged as to permit of supplemental treatment or filter beds, should such additional treatment later be found necessary, the issuance of a permit under the provisions of section 77 of the Public Health Laws will be considered.

Steps are being taken to require the purification of all domestic sewage and industrial wastes before discharge into the Mohawk river and tributaries, and I trust that this work will meet with your hearty coöperation.

Very respectfully,

EUGENE H. PORTER,
Commissioner of Health

ALBANY, N. Y., *February* 25, 1909.

BECKWITH LEATHER COMPANY, *Chadwicks, N. Y.:*

DEAR SIR:— As you are doubtless aware, an inspection of your tannery was made by the Engineering Division of this Department on January 27, 1909. According to the statements of your manager, Mr. Alexandre, a decided increase both in capacity and output have been made from time to time, causing a corresponding increase in the amount of sewage and tannery wastes discharged into Sauquoit creek since 1903.

Sections 75 and 77, chapter 468 of the Public Health Laws of 1903, explicitly state that no increase in the amount of sewage discharged by any mill, factory or industrial plant shall be allowed unless "Upon application duly made to the State Commissioner of Health by the proprietor, lessee or tenant of any shop, factory, mill or industrial establishment from which the discharge of refuse or waste matter into any of the waters of the state is otherwise prohibited by this act, the state commissioner of health shall have power to consider the case of said shop, factory, mill or industrial establishment, and whenever the public health and purity of the waters shall warrant it, he shall issue a permit for the discharge of refuse or waste matter from such shop, factory, mill or industrial establishment into any of the waters of the state, and may stipulate in the permit such modifications, regulations and conditions as the public health may require."

The records in this Department show that, according to the report made by W. W. Lambert, vice-president of the Beckwith Leather Company in December, 1906, the said company was at that time treating 500 skins per day and employing about 50 men while, according to the statements made by Mr. Alexandre in January, 1909, the company is now treating 1,000 skins per day and employing about 150 men.

The inspection showed further that sewage and wastes are allowed to escape from different outlets and to flow over the surface of the ground on its way to the creek while some of it is intercepted by a cesspool which is emptied into the creek periodically. This is a very insanitary practice and should not be continued. Numerous complaints have been received by the local board of health and by this Department of the nuisance created in the stream by the discharge of wastes from your tannery.

The inspection of the plant showed that the elevation of the floors of the tannery is high enough above the general level of the creek, and the buildings are far enough back from the creek to afford ample facilities for the installation of a settling tank. A properly constructed settling tank to treat all the wastes from the plant, if carefully operated, will undoubtedly relieve in a large measure the nuisance created by the periodical discharge from the cesspool and the discharge of sewage and wastes directly from the plant by taking out a large percentage of the putrescible solids in suspension which are now being discharged into the creek.

In view of the above and since it is understood that you propose to increase the output of the tannery to the extent that 200 men will be employed by August 1, 1909, I must require that you concentrate all your domestic sewage and tannery wastes at suitable points, conveying the same through closed pipes to a suitable site for treatment and then pass the same through properly constructed disposal works, plans for which must be prepared by you and submitted to this Department for approval not later than

June 1, 1909. This will give you ample time to consult a competent engineer and to have plans and specifications prepared.

In view of the fact that a cesspool is already constructed at your plant, and for the sake of economy, as well as the desirability of separating domestic sewage from industrial wastes, I would suggest that you use the present cesspool for domestic sewage only and construct a settling tank for the treatment of all your tannery wastes. In this connection I would call your attention to the necessity for providing proper facilities for the frequent removal of sludge from the settling tank.

I am enclosing a blank application for permission to discharge refuse or waste matter from your plant and on the return of this application properly filled out, accompanied by plans for preliminary treatment of the wastes from your plant by passing the same through a settling tank, so arranged as to permit of supplemental treatment on filter beds should such additional treatment later be found necessary, the issuance of a permit under the provisions of section 77 of the Public Health Law will be considered.

Steps are being taken to require the purification of all domestic sewage and industrial wastes before discharge into the Mohawk river and tributaries, and I trust that this work will meet with your hearty coöperation.

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

Application was received by the Department from the Beckwith Leather Company on May 29 and July 16, 1909, for permission to discharge soak or wash water from their tannery into Sauquoit creek.

On September 29, 1909, a provision permit was issued to the Beckwith Leather company, allowing the discharge of soak or wash water from the plant into Sauquoit creek. This permit contains the provision that no other wastes be discharged with the soak and wash waters into the stream and that all solid residues be conveyed to a suitable site for final disposal west of Sauquoit Creek.

COLONIE

ALBANY, N. Y., *December* 28, 1909.

THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— I beg to report on an inspection made at your direction of the sanitary condition of a small stream or drainage ditch which rises in the town of Colonie in Albany county and flows through the city of Watervliet.

As may be seen by referring to the correspondence files, several complaints have lately been received by the Department referring to the pollution of this stream or ditch and the resulting nuisance as affecting residents of the city of Watervliet and, although the matter has heretofore been referred to the board of health of the town of Colonie within whose jurisdiction most of the pollution occurs, no improvement in the sanitary condition of the stream has resulted.

On December 22, 1909, in company with Dr. John W. Burns, health officer of the city of Watervliet; Mr. John Schairer, Jr., president of the board of health of the town of Colonie, and Mr. Chris Valentine, member of said town board, an inspection was made of the stream along its course in the said town and city from a point near Fulton and Thirteenth streets, to its junction with Dry river, in the city of Watervliet.

The stream or drainage ditch commences at a point west of the Watervliet arsenal, and near Tenth street, and flows northerly between Eighth avenue and Fulton street to a point opposite Fifteenth street where it is met by the west branch which rises west of the D. & H. R. R. The main stream soon after the confluence of its branches crosses the city line, and then flows in northeasterly and easterly courses across Eighth, Seventh and Sixth avenues, and thence southeasterly to its junction with Dry river near Fifth avenue.

The stream or ditch furnishes surface drainage for the section of the town of Colonie west of the city of Watervliet, known as Mannsville, although there is little or no flow in the ditch during the greater portion of the summer season. Within the city the stream is covered with planking or brick arching at several points; at one point it passes under a house and at another point it flows under a shed.

A dump for ashes and garbage is maintained on the Dodge property along the west branch north of Fourteenth street, the dump being fenced in and used as a pig yard. During rains or freshets, because of the condition of the ditch, this dumping ground is overflowed and in this manner considerable polluting material and drainage from the dump reaches the stream. The members of the town board of health stated that on receiving notification from this Department during the past season of the pollution of the stream at this point, they had requested the owner of the property to make certain improvements which it was found during the inspection had been only partially carried out. They agreed to again take up the matter with the owner of the dump, and arrange to have an embankment built and to have the ditch channel cleaned out and deepened so that the stream would receive no more pollution from the dump.

Along the south branch of the stream some six or seven outside privies were found to be located directly on the bank of the stream near Fulton and Thirteenth streets.

The members of the town board stated that they had understood that all such outside privies were located at some considerable distance from the stream, so that the leachings would not flow directly into the stream. They stated that they would require the various property owners to move privies back twenty or twenty-five feet from the ditch and would, in the future, maintain an inspection of the stream for the purpose of preventing any pollution of its waters.

Along the stream within the city limits, one outside privy was found located directly on the bank of the stream and should be removed while on two other properties, the privies are so located as to demand their removal to greater distances from the stream unless after close inspection and tests it is found that no polluting matter enters the streams.

Although the waters of the stream or ditch were frozen at the time of inspection and the conditions were not favorable for determining the extent of the nuisance caused by the pollution of the stream, it was very evident that the stream, especially along its south branch, receives considerable pollution from leaching privy vaults, and that a condition of nuisance along the stream would result at times, especially during the summer months.

Within the city the stream also receives considerable pollution from the garbage and slops that are thrown into it and this insanitary practice should be stopped by the city health board.

From references to the "deepening" of the main branch of this stream or drain and the evident recognition of the existence of the drain occurring in the context of a bond executed in 1875 by the owners of the tract now called Mannsville, which guaranteed the proper maintenance of the drain in return for the right to deepen the drain "in order to more effectually drain" said lands, it would appear that the ditch or stream has for many years constituted a drainage course to care for surface water from sections west of the city and, in the absence of any legal opinion in the matter, it would seem that the drainage channel must be maintained.

The present pollution, however, should be removed from the stream, and I would recommend that this report be transmitted to the boards of health of the city of Watervliet and the town of Colonie and that they be requested to take the steps outlined above and abate the insanitary conditions resulting from the pollution of the stream until such time as the extension of the city limits or the growth of the section known as Mannsville makes feasible the construction of sanitary sewers in this section.

Respectfully submitted,

H. B. CLEVELAND,
Principal Assistant Engineer

On December 28, 1909, letters, enclosing copies of this report, were addressed to the health officer of the city of Watervliet and to the president of the board of health of the town of Colonie, requesting that they bring the matter to the attention of the boards of health and that they take the action necessary, as outlined in this report, to prevent any further pollution of the stream or drainage ditch within the jurisdiction of the boards.

GLEN COVE

ALBANY, N. Y., *February* 4, 1909.

MRS. WILLIAM I. FROTHINGHAM, *Secretary Village Improvement Association, Glen Cove, N. Y.:*

DEAR MADAM:— In further reference to the insanitary conditions existing in the village of Glen Cove by reason of the discharge of sewage and wastes into the stream passing through the village and in relation to which conditions you addressed me on December 16, 1908, I beg to state that I have had the matter reviewed by the Engineering Division, a careful inspection of these same conditions having been made during the past season by inspectors from this Department during a sanitary survey of oyster grounds and their surroundings within the State.

The report of the inspector shows that the stream in question is polluted along its course within and near the village of Glen Cove by sewage and wastes discharged from three main sewers or party sewers, one of these carrying the sewage and wastes from a leather belting works with 500 employees; from 44 private sewers carrying sewage and sink wastes; and from about sixty privies or outside closets located on the bank of the stream or over the stream and constituting a direct cause of nuisance. The report states that the general sanitary conditions in Glen Cove along this stream are very bad.

I can readily understand that the conditions which exist in the village have seemed serious enough to demand attention and to require remedial action, and am anxious to aid your Association and other public-spirited citizens as much as possible in a determined effort to improve the sanitary conditions of the village.

The legal means for removing nuisances are always available, under the authority of section 25 of the Public Health Law, and any conditions or set of conditions which in the opinion of the local board of health constitute public nuisances may be abated.

It would seem to me, however, that the most effective and rational way to permanently correct the insanitary conditions now existing in Glen Cove is to arrange for the construction of a modern sewerage system and sewage disposal plant. Although Glen

Cove is not an incorporated village, authority is provided under chapter 348 of the Laws of 1901 for the establishment of a sewer system in a district which shall be established upon petition of property owners by the town board.

I am sending you under separate cover a copy of the Public Health Law, said chapter 348 of the Laws of 1901 being quoted on page 104 and subsequent pages.

I believe, that should this question be agitated and the benefits to be derived by the construction of a sewer system be presented to the taxpayers, a successful move to construct such a system might be started.

I trust that this matter will receive the attention of your Association and that an active campaign will be started along the lines suggested. I shall be ready at any time to give you all the assistance within my power and trust that you will address this Department if any further information is needed.

I am sending a copy of this letter to the board of health of the town of Oyster Bay and believe that the board will be of material assistance in bringing about the improvement.

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

JAMESTOWN

ALBANY, N. Y., *February* 9, 1909.

Mr. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.*

DEAR SIR:— I beg to report an investigation made on February 4th and 5th at the request of Assemblyman A. F. Alden of Jamestown to examine into the question of the betterment of sanitary conditions in the city of Jamestown, Chautauqua county, which would result from a proposed improvement of the Chadakoin river, the outlet of Chautauqua lake, which flows through the city.

In company with a committee of city officials composed of Mayor Samuel A. Carlson, Health Officer John J. Mahoney, and Supervisor Frank O. Anderson, an inspection trip was made along the entire stream from the boat landing at the end of the navigable portion of the river adjoining Chautauqua lake to the easterly boundary of the city.

Although, on account of the coldness of the season and the full-stream stage of the river no condition of nuisance could be said to exist in the stream at the time of inspection yet the conditions with respect to the character of the stream and its banks, the variation of flow, the use of the stream at some points for water power, together with the inevitable pollution which such a stream in such a situation receives, would seem to indicate that in times of low water in the outlet insanitary conditions would exist. It was very generally stated by the city officials and others interviewed that at certain seasons of the year a condition of nuisance exists in the stream.

Jamestown is a growing city located in the south-central portion of Chautauqua county on the outlet of Chautauqua lake (Chadakoin river) about three miles below the lake. The Salamanca and Cleveland branch of the Erie Railroad passes through the city. The population has increased from about 16,000 in 1890 to 23,000 in 1900 and to over 30,000 at the present time. The principal industries are wood working factories, worsted mills and metal works.

The water supply for the city is derived from artesian wells, located in the Cassadaga creek valley about three miles northeast of the city, and is first pumped to a distributing reservoir and then from the reservoir is pumped into the mains.

The sewerage system is constructed on the separate plan, a long outlet line nearly four miles in length conveying the sanitary sewage to Cassadaga creek. When the sanitary system was first constructed the sewage was discharged into Chadakoin river, below the Dexterville dam. About ten years ago, as a result of proceedings instituted against the city on account of the pollution of the river at this point, the outlet was extended to Cassadaga creek at a cost of about $50,000.

Chadakoin river is navigable from Chautauqua lake to the steamboat landing just above the upper railroad bridge in the city, a distance of about three miles. The stream varies in width but in general is from 75 to 100 feet wide through the city. There are three water power dams within the city limits. The upper dam, known as the Warner dam is located about three-fourths of a mile below the boat landing. The Wilson dam, located about one mile down stream from the Warner dam is situated just westerly from Footes avenue. The Dexterville dam is situated about seventy-five feet up stream from the lower Erie Railroad bridge. The stream has a fairly good fall through the city and follows a tortuous course through the central and lower portions of the city. The available water power heads at the three dams are approximately ten feet, eight feet, and 12 feet, respectively. Above the dams the stream widens and gravel beds have been formed which are overflowed at times of high water. In the ponds formed by the dams and in many portions of the streams old logs are floating or have settled to the bed of the river.

The drainage area of the river above the foot of the lake is 190.6 square miles of which 20.8 square miles comprise the lake surface. The region about Chautauqua lake is practically cleared of forest. From measurements made by E. C. Burns, C. E., in 1895, the low summer flow in the stream was estimated to be 45 second feet, and from records of gage heights furnished by wheelwrights to Mr. Burns, he estimates the extreme low water flow to be 25 to 30 second feet. It was estimated that the ordinary flood flow in the stream is from 2,000 to 2,200 second feet and that the maximum flood flow probably exceeds 2,500 second feet.

There are thirty-two manufacturing establishments located adjacent to the stream from the steamboat landing to the Dahlstrom metallic works below the lower railroad bridge. Six or eight of these plants derive some of their power from the water power of the stream, and one, the Dahlstrom metallic works located below the Dexterville dam, uses water power entirely. Six of the total number of manufactories are located along a raceway leading from the Warner dam. These are the L. B. Warner estate planing mill, Sherman Brothers Lounge Company, Jamestown Iron Works, Grandon Grist Mill, Jamestown Metallic Furniture Company (in course of construction), and the Broadhead Worsted Mill. All of these plants, except the last named, are operated partly by water power.

The stream is considerably polluted by domestic sewage notwithstanding the fact that a sanitary sewer system is constructed in the city. Two old sewers along Main street on each side of the river and serving eleven business blocks discharge into the stream. In addition there are ten or twelve short private sewers, which discharge into the river or tributary brooks. Sewage is also discharged directly into the river from ten of the factories along its course although in some instances a portion of the sanitary sewage from these factories is discharged into the sanitary sewer system. The number of persons served by such factory sewers discharging into the river is approximately 1,000. The superintendent of public works stated that as rapidly as possible connections were being made from the factories to the sanitary sewer system thereby relieving the river from sewage pollution.

Within the central portion of the city twelve storm drains discharge into the river although a great portion of the street and surface wash is carried by gutters and in the brooks to the river.

Above the city at the foot of the lake the sewage from Celoron is discharged into the outlet. This is a summer resort with a summer population on special days of 1,000 to 1,500 and a normal population of 700 or 800.

The manufacturing wastes discharged into the streams are not considerable since the greater proportion of the factories along the streams are wood working establishments. The greatest amount of manufacturing wastes discharged into the stream comes from the dyeing and scouring processes of the Broadhead Worsted Mills which employ 1,000 persons and produce 100,000 pieces yearly. This plant is located at the end of the head race leading from the Warner dam.

There is then considerable pollution added to the river during its flow through the city which may be classed under three headings:

1. Sanitary sewage.
2. Manufacturing wastes.
3. Street and surface washings carried by storm drains, gutters and watercourses; together with garbage and refuse thrown directly into the river.

It is feasible, by the connecting of factories, business blocks and residences with the sanitary sewer system, to remove practically all of the first two classes of pollution — the sanitary sewage and manufacturing wastes — now discharged into the river within the city.

But the street and surface washings from an area of nearly 2,500 acres of the built-up portion of the city, must of necessity be carried to the river and a certain amount of pollution from street washings will therefore find its way to the stream, such pollution, especially the first wash of rains, sometimes being very considerable.

A proposition has been advanced to deepen and straighten the channel of the river through the city and thus by lowering and confining the stream to prevent the overflow of several large areas in the heart of the city which now occurs even under ordinary summer flood conditions.

If such improvement is found feasible, a proper deepening and straightening of the channel of the river would unquestionably prevent to a large degree the deposition of any organic or decomposable matter which may now occur during flood periods over considerable areas of gravel bars and low-lying lands in and adjacent to the river.

A second and very important sanitary benefit to the city resulting from a deepening and improvement of the channel would be the prevention of flooding of cellars. From the vicinity of Main street below the Warner dam eastward and especially for half a mile or more below Footes avenue, during spring freshets and at times during the summer season, the cellars of many business blocks, factories and private dwellings are flooded, giving rise to very insanitary conditions as well as considerable financial detriment to the properties affected.

Finally, an important benefit that might be brought about by the improvement of the river channel would be the reclaiming of considerable areas of river flats. Although this is essentially an economic consideration, it has also a sanitary significance since the reclaiming of land would involve also the elimination of several areas that may be breeding places for mosquitoes and sources *of malaria*. At two or three points, especially just below Footes avenue, and between Windsor street and Chanler street (extended) a straightening of the river channel together with the deepening thus made possible and in connection with a deepening of the entire channel and the possible removal of one or two of the dams, would reclaim large areas of river lands that are not now available owing to the flood conditions which prevail.

It would seem, then, that a positive and important improvement in the sanitary conditions of the city would be brought about by the deepening and straightening of the Chadakoin river as it flows through Jamestown.

Before any improvement is undertaken, a careful study should be made of the conditions with respect to the flow of the stream, the hydraulic factors involved and the property interests which would be affected by the proposed improvements. Then a plan of improvement should be adopted which, while providing for a permanent improvement of both sanitary and economic advantage to the city, would preserve as far as is consistent with the necessary and desirable improvement of the river, the water power rights now utilized to a greater or lesser extent by riparian owners along the stream.

It appears that no work has heretofore been undertaken in improving the river channel through the city and it is said that encroachments on the river channel are partly responsible for the floods which now occur in the city. It is obvious that if left to the future, the work of improvement will continually grow more difficult and expensive.

Considering the important rank to which Jamestown has every reason to hope to attain in the future as a large and prosperous city, it is inconceivable that the Chadokin river should be left in its present condition indefinitely.

I would, therefore, recommend that the city authorities be communicated with and urged to take whatever action may be found necessary, such as the preparation of preliminary estimates of cost, that will advance the proposition to improve the channel of the Chadakoin river as it passes through the city.

Respectfully submitted,

H. B. CLEVELAND,
Principal Assistant Engineer

Letters inclosing copies of this report were transmitted to the city authorities on February 25, 1909, calling their attention to the conclusions and recommendations contained in this report and stating that in the opinion of the commissioner a proper deepening and straightening of the channel of the Chautauqua lake outlet through the city would result in an important improvement in the sanitary conditions of the city and would also be of considerable benefit on economic grounds.

LIBERTY

ALBANY, N. Y., *October* 13, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of an investigation of sanitary conditions in the town of Liberty, Sullivan county, made at your request by the Engineering Division, a complaint having been received on August 10, 1909, from Mr. Ben R. Gerow which stated that a nuisance was created by the overflow of cesspools on the property of William H. Nichols.

At the time of the inspection of the sanitary conditions of the village of Liberty, on September 21, 1909, by Mr. C. A. Holmquist, assistant engineer of the Engineering Division, it was learned from the complainant that he had brought suit against Mr. Nichols to recover damages for allowing the cesspools to overflow and run across his property and that the case was pending in the courts. In view of the above, since the matter is to be adjudged in the courts, it was not considered necessary to consider the case in detail.

The other cesspool in question is maintained by Herman Hollender in the hamlet of Parksville, Sullivan county and about four miles from the village of Liberty. The inspection was made in company with, and at the request of, Dr. C. S. Payne, health officer of the town of Liberty, C. A. Shaw, supervisor, and William Intemann, county clerk and registrar for the town board of *health,* with a view of determining what steps should be taken either to abate the nuisance created by the overflow of the cesspool or what could be done to remedy the condition.

It was found that Mr. Hollender keeps a summer boarding house and accommodates about 125 guests. The wastes from the boarding house are discharged into a rectangular cesspool located about 100 feet from the house and at the edge of the precipitous bank of the Beaver Kill, a tributary of the east branch of the Delaware river.

It seems that the cesspool is not adequate to meet the demand that is made upon it during the summer boarding season and that it overflows and the contents are allowed to run down the hill, across the Liberty–Livingston Manor road and finally discharge into the stream at the foot of the hill.

At the time of the inspection, the season was practically over and only a few boarders remained so that the cesspool, although nearly full, was not overflowing. The sanitary conditions around the cesspool, however, were very bad and showed evidence of recent discharge and the health officer stated that when the house is full a large amount of sewage from the cesspool is allowed to flow down the hill and discharge into the stream.

The local board of health has been unable so far, to abate the nuisance and stated that although three fines of $25 each had been imposed upon Mr. Hollender during the past season these fines have simply been paid and the same insanitary conditions allowed to continue.

In view of the above I would recommend that the local board of health be advised that it is within their jurisdiction to require, after adopting some definite regulations in the matter, that the insanitary practice of disposing of wastes be discontinued on the ground that the conditions constitute a public nuisance, or that said board bring action under the provisions of section 76 to 85 inclusive of chapter 45 of the Consolidated Public Health Law inasmuch as no permit has been issued by the commissioner allowing the discharge of sewage from this cesspool.

This law provides that " No person, corporation or municipality, shall place or cause to be placed, or discharge or cause to be discharged into any waters of this state, unless the same shall have been permitted by the State Commissioner of Health, any sewage, garbage, offal, dead animal, dead fish, dead bird or part thereof, or any decomposible or putrescible matter of any kind or any substance, chemical or otherwise, containing the same in quantities injurious to the public health, or any refuse or waste matter, either solid or liquid, in quantities injurious to the public health from any shop, factory, mill or industrial establishment; unless express permission to do so shall have been first given in writing by the State Commissioner of Health as provided in this article, etc."

The law further provides that " the penalty for discharge into any waters of the state any other matter prohibited by this act, besides that specified above shall be twenty-five dollars and five dollars per day for each day the offense is maintained."

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *October* 26, 1909.

CHARLES S. PAYNE, M.D., *Health Officer, Town of Liberty, Liberty, N. Y.:*

DEAR SIR:— The report of Mr. C. A. Holmquist, assistant engineer in this Department, who recently inspected conditions in the town of Liberty, shows that very insanitary conditions constituting a public nuisance were maintained during the summer season at the boarding house of Mr. Herman Hollender in the hamlet of Parksville.

It appears, since Mr. Hollender has three times paid his fine, that he does not deny the existence of the nuisance but that repeated fines do not deter him from maintaining the objectionable conditions complained of.

I would advise your board, in case further trouble is experienced at this point, to obtain an injunction restraining Mr. Hollender from a continued maintenance of the nuisance. Such action may be brought under the provisions of sections 76-85 inclusive of chapter 45 of the Consolidated Public Health Laws, inasmuch as no permit has been issued by this Department allowing the discharge into the stream of the overflow from cesspools of Mr. Hollender.

It is understood that the complaint made by Mr. Ben R. Gerow against a nuisance maintained by Mr. W. H. Nichols has resolved itself into an action at law.

I trust that your board will take active steps to abate the nuisance on the property of Mr. Hollender should conditions again become offensive.

Very respectfully,

EUGENE H. PORTER,
Commissioner of Health

LOCKPORT

ALBANY, N. Y., *March* 16, 1909.

Mr. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— I beg to report herewith on an investigation made on March 5th and 6th to examine into the pollution of Eighteen Mile creek as it flows through the city of Lockport, Niagara county, caused by the discharge of sewage from the city of Lockport and of manufacturing wastes from various paper and pulp mills and other manufacturing establishments located on the banks of the stream.

The investigation was undertaken in response to a petition signed by some ninety residents of the town of Newfane, Niagara county, directed to Dr. W. Levell Draper, assemblyman from the second district, Niagara county, and by him referred to this Department.

The petition complained of the pollution of the stream by sewage from the city of Lockport and by the poisonous refuse of paper and pulp mills and other industries along its shores. The petition further stated that the stream was at one time well stocked with choice fish, but that the poisonous matters which are continuously being dumped into this stream have left it barren of fish life, save a few stray carp; that the stream runs through a rich farming country and along its borders are rich pasture lands, but the water is so foul from pollution that cattle and other stock refuse to drink it; and that the petitioners believe that the pollution of the stream is very detrimental to life and health.

An appointment was made with Mr. Charles D. Corwin of Newfane and a committee of eleven residents and property owners of the town of Newfane were met in Lockport, an inspection of the stream being made later at Newfane and at Burt in company with several members of the committee. At the conference with the committee statements were made by several parties that live stock of all kinds either refused to drink the water from Eighteen Mile creek when pastured along the borders of the stream for eight or ten miles below Lockport, or were injuriously affected on drinking the water.

The effects of the pollution as described by the committee were in general accordance with those stated in the testimony taken by the board of health of the town of Lockport in 1901 preceding a former investigation made by the Department, said testimony appearing in the Twenty-second Annual Report of this Department.

Former Investigation by Department

On April 10, 1899, Charles E. Dickinson, President of the Franklin Mills Company, manufacturers of flour and breakfast food complained to the Department of the pollution of Eighteen Mile creek above the Erie canal by sewage discharged from several city sewers. An investigation was made by Prof. Olin H. Landreth, consulting engineer for the Department, who reported in part as follows:

" The only thorough remedy for the decidedly insanitary and intolerable condition of the creek is to make other and better provision for the disposal of the garbage and sewage from this district. The next best remedy, and probably the one which the citizens will consider most feasible would be to convert the stream through the city into a trunk sewer, building a new sewer along the portions of the stream now open, and rebuilding or lining such parts of the covered portions of the stream as may be necessary to furnish a tight smooth channel.

"I did not examine Eighteen Mile creek below the city and do not know whether the continuation of this east branch as a sewer is likely to be objectionable or injurious to the territory below the city, but was informed that it was not. If this can be verified, I beg to recommend that the city authorities be directed to make the improvements described, unless they are prepared to carry out the better remedy or removing both sewage and garbage from the creek altogether and to make other and better provision for it."

On July 19, 1899, this report was transmitted to the authorities of the city of Lockport by the then State Board of Health and they were directed to take steps to abate the nuisance found to exist.

On September 2, 1901, an inspection was made by Prof. Landreth of the work being done by the city in constructing new sections of arching and relining old sections and it was found that the contract let covered the rebuilding of old section of culvert or the arching and covering of unimproved sections of the creek from the southerly line of the New York Central Railroad to the point of passing under the Erie canal.

The investigation and the work of improvement referred to above relate only to the pollution of the stream above the Erie canal by domestic sewage and do not relate to the pollution of the stream by manufacturing refuse at lower points, but the matter has at this time been reviewed as having a direct bearing upon the problem presented.

The pollution of Eighteen Mile creek by manufacturing refuse has, however, received the attention of this Department at a previous time, since an investigation of the pollution of this stream was made by Prof. Landreth on September 16, 17 and 18, 1901.

This investigation was undertaken in response to a communication addressed to Governor Benjamin B. Odell, jr., by the board of health of the town of Lockport and referred by the Governor to this Department for investigation. Enclosed with the communication was a copy of minutes of a public hearing held by the board on August 8, 1901, at which the testimony of several property owners and residents of the town of Lockport, above-referred to, was heard as to the injurious effect on the stream of the discharge of wastes from mills in the city of Lockport.

The operations at the various mills were fully described in the report to the Department submitted by Professor Landreth on October 14, 1901, and statements as to the processes and production at the various mills found later in this report are based on such description corrected to show changes and additions which have taken place up to the present time. The report of the investigation of the pollution of the stream from manufacturing wastes carried on in 1901 concluded as follows:

"1. That the stream referred to is foul in character, unfit for use for either potable purposes or for the watering of stock or other agricultural purposes, except for watering of gardens or crops.

"2. That the banks and bed of the stream are badly coated with offensive organic matter, which, in my opinion, can hardly fail to give rise to offensive and harmful odors and emanations whenever the banks or bed are exposed during warm weather.

"3. That, in my opinion, the various substances found to be discharged from the several mills above referred to are ample to fully account for the insanitary and harmful conditions found in the stream, and the conditions described are such as should properly be expected from the materials thrown into the creek."

From the records available in the Department, it does not appear that the matter of abatement of conditions was taken up individually with the several manufacturing establishments subsequent to the investigation.

Description of Stream and Tributary Watershed

Eighteen Mile creek (middle branch) rises near the easterly boundary line of the city of Lockport opposite the central portion of the city and flows westerly and northwesterly through the city having a fall of nearly 250 feet within the city limits. The flow of the stream as it passes through the city would naturally be very small on account of the limited drainage area, but since the construction of the Erie canal, the surplus water not used to operate the locks or to feed the canal to the east of Lockport has been diverted to Eighteen Mile creek. It is stated in Rafter's "*Hydrology of New York*" that this diversion of water has amounted to 300 second feet.

Continuing in a northerly direction from Lockport through a farming and fruit country, the stream crosses the southerly line of the town of Newfane after two and one-half miles of flow and is joined about three and three-quarters miles below the city by the east branch or "Red" creek. Seven and one-half miles from Lockport the stream passes through the unincorporated village of Newfane which has a population of about 600. About two and one-half miles further down the stream is Newfane Station, or Burt, with a population of 100, and after flowing about twelve miles from Lockport the stream discharges into Lake Ontario at Olcott, a much frequented summer resort on the lake front with a population of from 350 in winter to 3,000 in summer, although on special days many thousands visit the resort.

After leaving the city of Lockport the stream flows through alluvial flats and has comparatively little fall for the first six miles — about forty feet as compared to one hundred feet during the last six miles. During the first six miles of flow the channel of the stream in most places is comparatively shallow and the banks are more or less subject to overflow which would tend to aggravate any nuisance due to the presence of suspended matter in the stream by causing it to be deposited on the bottom lands.

The east branch of Eighteen Mile creek, flowing as it does over red clay deposits, is highly turbid and imparts considerable color to the waters of the main stream.

Growth of Lockport and the Development of its Manufacturing Interests

In 1905, Lockport had a population of 17,552. Its population is now estimated at about 18,000. The establishment of the city as brought about by the construction of the Erie canal and the consequent industrial development in the valley of Eighteen Mile creek are interestingly described in the following extract from Rafter's "*Hydrology of New York:*"

"At Lockport the construction of the Erie Canal through the mountain ridge created a fall of 58 feet at a single point, and since the use of water for lockage purposes is only a small part of the whole flow, the balance required to feed the canal to the east of Lockport is necessarily discharged around the locks into the lower canal by means of sluiceways. Under the laws of 1825 a public auction was held in the village of Lockport, in the fall of that year, and the right to use this surplus water sold to Messrs. Richard Kennedy and James H. Hatch (for $200 annually), whose successors at the present day constitute the Lockport Hydraulic Power Company.

"Lockport has usually been considered more purely a result of the canal development than any other point in western New York, for the reason that while nearly all other towns in the region had some growth before the Erie Canal was located, it was only in 1821, after the present location for the canal had been definitely decided on, that the nucleus of a village was formed here by the contractors and their workmen employed on the canal. In 1820 there was no frame house or barn within 5 miles of Lockport, and there were less than 600 acres of cleared land in the 4 square miles, of which the city of Lockport is now the center. Moreover, there are no natural advantages which would have naturally led to the growth of an important town at this point.

"When once started, however, under the impulse of the canal development, Lockport grew rapidly until, in 1829, with a population of 3,000, it was incorporated as a village, and in 1865 as a city. The population in 1890 was 16,038; in 1904 it is estimated at over 17,000.

"The total investment in manufacturing plants at Lockport dependent on the Erie canal water supply amounts to $2,531,000. The total number of establishments is 33, employing 1,880 operatives. The total power now in use on the Erie canal proper is 2,625 net horsepower.

"A short distance to the east of the foot of the locks a small stream known as the west branch of Eighteen Mile creek crosses under the canal. This stream, although having a catchment area of only one or two square miles to the south of the canal, has cut a deep valley with rapid fall for a considerable distance to the north of the canal. In order to provide for discharging the surplus waters from the canal, an overflow into Eighteen Mile creek was constructed at an early day. A mill was also permitted to take water from the lower level and discharge its tail-water into the creek. Finally the Jackson Lumber Company was permitted to construct a sluiceway on the tow-path side, through which it drew for many years about 600 cubic feet per second (reduced to 300 second feet since 1892), which was all discharged into Eighteen Mile creek. Complaints having frequently been made that boats were drawn against this sluice on the tow-path side, the Superintendent of Public Works, in 1892, granted a formal permit to the Jackson Lumber Company to construct a sluice and subway under the canal bottom, by which this water is now drawn from the berme side. Under this permit a substantial masonry sluice was constructed in 1893. In the meantime the Jackson Lumber Company has gone out of existence and this water-power has passed into the hands of the Traders' Paper Company, which now occupies the site with its pulp mill No. 1.

* * * * * * * * * *

"With 2,625 net horsepower in use on the canal proper, and 3,835 on the west (middle) branch of Eighteen-mile creek, the total actually in use at Lockport, and dependent on Erie canal for its water supply, is 6,460 net horsepower."

Sewerage

From 1850 to the present time sewers have been constructed in the city of Lockport on the combined plan to carry both sewage and storm water. In the report of the sewer committee of the common council made to this Department on September 4, 1903, in accordance with chapter 468 of the Laws of 1903, twelve outlets were named as discharging into either the Erie canal or Eighteen Mile creek, the total population served by these sewers being about 10,350, of which 4,625 were served by sewers discharging into Eighteen Mile creek. Since that time three new sewer outlets have been constructed which discharge into Eighteen Mile creek so that the population served by sewers discharging directly into Eighteen Mile creek is now upward of 5,000.

Water Supply

Prior to February 3d of the present year the water supply for the city has been obtained by pumping from the Erie canal. In 1904 the consumption was stated to have been about 1,771,000,000 gallons or 276 gallons daily consumption per capita.

Although in general the water supply derived from the Erie canal was not used for potable purposes, yet in certain sections of the city such use was made of the water and the precaution of boiling was neglected, resulting in considerable typhoid fever. Owing to the high typhoid rate in the city, an intake main was constructed to the Niagara river at a cost of $700,000, and since February 3d of this year this new supply has been in use.

Description of Mills on Eighteen Mile Creek

Named in the order of their location down the stream the following mills are situated on the banks of Eighteen Mile creek: Lockport Leather Board Company, United Box Board and Paper Company (formerly Traders' Paper Company), Lockport Paper Mill Company, Niagara Paper Mill, United Indurated Fibre Company of New Jersey, Westerman & Company Rolling Mill. Cowles Aluminum Works.

A description of the processes and a statement as to the output of each mill is given below.

There has been very little change in the capacity of the mills since 1901, the principal additions being a machine works on the grounds of the United Box Board and Paper Company, and a slight increase in capacity in the Niagara Paper Mill. During the financial depression of the past year or two the output from some of the mills has decreased to from thirty to fifty per cent. of the capacity and condition of output in 1901.

The Lockport Leather Board Company

This mill has been in operation since November, 1907, and employs eight men. It is situated on the north bank of the canal at the Eighteen Mile creek culvert. The average daily output of the plant is one and one-sixth tons of leather board. It was stated at the plant that if operating at full capacity (12 T. of leather board per week), 30,000 pounds of leather scrap and 4,200 pounds of old paper would be used; 700 pounds of leather, 100 pounds of paper, 20 pounds of alum and 3½ to 5 pounds of color being used in preparing each beater. No subsequent screening to recover wastes is employed at this plant. Formerly oil of vitriol was used in the process but its use has been discontinued owing to complaints by the United Box Board and Paper Company of the effect of its presence in the wastes discharged into the stream.

The United Box Board and Paper Company

This company owns and operates six plants as follows, all the mills being situated on Eighteen Mile creek and comprising with the Lockport Leather Company the first mills below the canal.

The Lockport Pulp Mill, in operation since 1889.
The Franklin Pulp Mill, in operation since 1887.
The Niagara Pulp Mill, in operation since 1889.
The paper mill at the dam, in operation since 1896.
The paper mill at the dam, No. 2, in operation since 1900.
The sulphite pulp mill, in operation since 1901.

From 1895 until about 1902 these mills were operated by the Traders' Paper Company, but since that time have been under the present management.

The company manufactures ground wood pulp, sulphite pulp and heavy paper. The daily output at present is 26 tons of ground wood pulp, 18 to 20 tons of sulphite pulp (capacity of plant 25 tons) and 55 tons manila board (when running full capacity). In 1901 the production varied from the present in that 35 tons of ground wood pulp and 15 tons of sulphite pulp were manufactured. The company employs about 300 men in all the plants.

From the Lockport pulp mill of this company one-half the stock is piped to the paper mills and one-half is pressed into sheets, the latter process occasioning considerable more waste discharge than when the pulp stock is passed directly to the beaters at the paper mills. From the Franklin pulp mill and from the Niagara pulp mill the pulp is piped directly to the beaters. At both paper mills of this company, savealls or rotary screens treat about two-thirds of the fibre-carrying water from the paper machines.

The refuse turned into the creek from the plants of this company comprise:

1. The sulphite liquor from the sulphite process disgesters and the wash water from the pulp tanks into which the pulp is run from the digesters.
2. The wash water from the beaters where the old paper is macerated and washed. (About three tons of old paper being used daily in the mills.)
3. The general washings and drainings from the various parts of the several plants.
4. The sewage from the workmen employed at the works.

As a result of a complaint of the pollution of the stream made by the Niagara Paper Mill Company, a sewer was constructed in the bed of the stream a few weeks after the sulphite mill was put in operation to carry the sulphite mill wastes below the point from which the Niagara paper mill took its water from the stream, and this pipe extends through a waste weir gate in the dam at the Lockport Paper Company.

Lockport Paper Company

This company was incorporated in 1884. The president of the company is George G. Moss, Lockport, N. Y., and the secretary and treasurer is Wallace I. Keep, Lockport, N. Y.

The company manufactures building paper, roofing paper and heavy wrapping paper. It uses as stock about twenty tons of old rags and ten tons of old paper daily. Its output is ordinarily about twenty-eight tons daily, indicating a loss from waste of about two tons per day, most of which goes into the stream. The greater part of the stock is not bleached. During the year 1908, about 8,660 pounds of chloride of lime and seventy-five tons of color were used, mostly iron oxides and earth colors. The company usually employs from 90 to 100 men, though at present the output is only about 30 per cent of normal and during 1908 averaged about 50 per cent., or fourteen tons of paper. The capacity has not been increased since 1901.

From one-half to three-fourths of the waste water from under the paper machines in which is carried waste stock is turned back to the stock mixers in front of the paper machines.

The refuse discharged into the creek from this plant comprises:

1. The loss of manufacture, amounting to about two tons per day under full operation, a large part of which goes out through the beaters.

2. The general drainage from the rolls and other parts of the mills, carrying a large amount of coloring matter and some pulp waste.

3. The refuse bleach liquor, of which the amount as shown above is inconsiderable.

4. The sewage from the employees at the mill.

Niagara Paper Mill Company

This company was incorporated in 1889. The secretary-treasurer is George E. Green, Lockport. The product of the mills is a line of colored specialties in mottled, marbled and highly tinted papers. Its output in 1901 was from five to six tons daily, but since that time one of the old paper machines has been replaced by a new one, thereby increasing the daily output to eight tons. The stock used is old rags, rope, jute and some paper. Chloride of lime is used to bleach, aniline dyes are used for coloring and alum is used as a mordant. Resin and alum are used for sizing. The chloride of lime used amounts to five or six tons per year. During the past two and one-half years an average of sixty to seventy tons of alum per year have been used. For the past one and one-half years, there have been sixty employees at the mill, and the maximum number under full operation is seventy.

A saveall of screening machine recovers waste carried by water from the paper machines.

The refuse discharge into the stream from this mill includes:

1. Wash water from the beaters, carrying the refuse from the rags, paper, rope and jute.

2. The drainage from the rolls and from the mill floors, containing coloring matter and some pulp.

3. The refuse bleach liquor, the amount of which is probably not very great.

4. The sewage from the mill employees.

The United Industrial Fibre Company of New Jersey.

This company was incorporated under the laws of New Jersey in 1892. The official place of business is Lockport. The President of the company is Jesse Peterson of Lockport.

The company manufactures indurater fibre utensils and ware, pails, basins, covers, etc., the total product being about 700 dozen daily. The material used for stock is ground wood pulp, 45 per cent. and old paper and rags, 55 per cent. The paper and rags are not bleached but are worked through the beaters to macerate the stock. About 10 per cent. of the entire product is sized, sixty-six pounds of sizing being used daily, composed of two-thirds alum and one-third resin and soda-ash. The loss of sizing amounts to about 15 per cent. About 225 men are employed at the works.

The refuse discharged into the stream from this establishment comprises:

1. The wash water from the beaters.
2. The waste and drainage from the pulp rolls or presses where the sized pulp is handled, also from the other pulp rolls.
3. The general drainage from the several operations throughout the plant.
4. The sewage from the mill employees.

The Westerman & Company Rolling Mill

No wastes are discharged from this plant except sewage from the 110 men employed night and day. No acids are used in the processes.

The Cowles Aluminum Works

This plant was not in operation at the time of inspection, but at the time of the former investigation referred to, it was stated by the manager of the works that this company discharged no refuse whatever into the stream.

The New York Cotton Batting Company

This plant is located near the canal on the east bank of the stream or pond above the paper mills of the United Box Board and Paper Company. No dyeing, washing or scouring is carried on at this point, but sewage from six or eight employees is discharged into the stream.

Reports of Above Establishments under 1903 *Law*

Of the above establishments, four submitted reports to this Department within sixty days from May 7, 1903, as required by chapter 468 of the Laws of 1903. These reports are in substantial accordance with the information given above except that in the case of the first three companies the statement showing the output exceeds that stated above as the output under the operations as carried on.

These four concerns from which reports were received were:

The United Box Board and Paper Company.

The Lockport Paper Company.

The Niagara Paper Mills.

The United Indurated Fibre Company of New Jersey.

Pollution of Stream Below Lockport by Industrial Wastes

During the partial inspection of the stream below Lockport, it was learned that Eighteen Mile creek receives some manufacturing refuse at Newfane and at Burt.

At Newfane, the plant of the *Fredonia Preserving Company* gives employment to about 120 persons for three months in the canning season and liquid wastes and washings are discharged through a 6-inch sewer directly into the stream.

At Newfane also is located a *felt mill* employing fifty persons. It was stated that no dyeing is done at this mill, although about one-half of the wool used in the manufacturing is scoured and the wastes from this process add some pollution to the stream.

At Burt, the *Niagara Spray Company* manufactures a spray for fruit trees. The plant is operated about four months in the winter season and employs three or four men. The output last year was 3,000 fifty-gallon barrels and it is expected that the output this year will be 10,000 barrels. In the process lime and sulphur are boiled together and the insoluble particles, mostly of lime rock, are discharged over the bank into the stream. The loss is estimated at 5 per cent.

Appearance of the stream at Points of Inspection

Owing to the fact that the stream was frozen over at most points at the time of the recent investigation, opportunity for inspection to determine the extent of pollution of Eighteen Mile creek and the presence of suspended matters in its waters was limited.

Inspections of the stream were made at several points, however, and samples of water were secured for physical examination at:

1. A point just south of the Erie canal.
2. At the bridge below the aluminum works.
3. At the highway bridge in Newfane.

At a point south of the Erie canal, above the influence of the discharge of manufacturing wastes, the stream showed considerable evidence of sewage pollution. At this point the suspended matter in the stream was finely divided, gelatinous and light in color.

At the bridge below the city and below all the mills within the city limits the stream carried considerable suspended matter of a fibrous nature. This appeared in small flakes and strings of a brownish yellow color. Along the banks and bed of the stream at this point a coating of gray fibrous matter had accumulated and tufts of this matter caught on sharp rocks and on brush projecting into the stream. It was learned that at the time of the inspection of the stream at this point, no discharge from the digesters in the sulphite pulp mill of the United Box Board and Paper Company was taking place, although white foam appeared on the surface of the stream similar to that which may be found in the vicinity of sewer outlets which discharge waste sulphite liquor. Undoubtedly this marked appearance of the stream was due to the effect of periodic discharges of waste sulphite liquors prior to the time of inspection of the stream.

At the bridge below the sawmill dam in Newfane the water was almost as highly charged with suspended matter of a fibrous character as at the point just below the city, although the flakes and masses were smaller and darker colored. The water in the stream at this point on the day of inspection had a slate-gray color, while the sample taken had a reddish appearance. This may have been partly due to the influence of the waters of "Red" creek, which flows over bottom lands of red clay. At this point also, 7½ miles from Lockport, masses of dark gray fibrous matter, clearly distinguishable from dead leaves and ordinary river sediment, were found along the banks of the stream.

No offensive odors such as are complained of as occurring during the summer months were noted during the inspection of the stream.

Summary and Conclusions

In conclusion it may be said in regard to the pollution of Eighteen Mile creek that based on the evidence herein presented:

1. Under ordinary operating conditions of the pulp and paper mills along the stream in the city of Lockport and in accordance with data obtained in similar investigations by this Department as to the proportionate amount of wastes occasioned by the manufacture of pulp and paper, there is discharged daily into Eighteen Mile creek from the processes used in producing 47 tons of ground and wood pulp, 20 tons of sulphite pulp and 107 tons of paper and indurated fibre ware, the following approximate amount of waste matter: 8.6 tons of lost pulp or wood fibre, and cloth fibre; 25 tons of lignin or woody refuse from the manufacture of sulphite pulp; 7 tons of chemicals, such as lime, sulphur, spent dyes, sizing, etc.

2. Some pollution of the stream by manufacturing wastes occurs in the town of Newfane, although such pollution is inconsiderable in amount compared to that discharged from the mills in Lockport.

3. The domestic sewage from a population of over 5,000 persons in the city of Lockport is discharged through outlets of the city sewer system directly into the stream as well as the closet sewage from 800 employees in the various mills.

4. The discharge of waste matters from the pulp and paper mills in the city of Lockport as above described grossly pollutes the waters of Eighteen Mile creek and causes a deposit of offensive organic matter on the banks and bed of the stream.

5. Although the discharge of sewage into the stream injures somewhat the sanitary quality of the water, the amount of such discharge is not sufficient to create a nuisance in the stream in and of itself and its general injurious effect on the stream is inappreciable as compared to the effect of the industrial wastes discharged into the stream.

6. The pollution of Eighteen Mile creek by manufacturing refuse from the pulp and paper mills situated in the city of Lockport

creates a public nuisance inasmuch as the effect of such pollution is such as to render the waters of the stream unfit for use as a public water supply or for the watering of live stock; to impair the value of the stream for other agricultural and domestic uses; to create offensive conditions in the stream; and in such other ways to seriously interfere with the rights of riparian owners along the stream and the comfort and convenience of residents along its course.

Discussion of Remedial Action

In general the processes employed in the various pulp and paper mills for the recovery of lost fibre from the manufacturing processes and the means employed to minimize such loss as described by the officials at the mills is in accordance with the better practice in the trade. A closer inspection of the processes than was possible at this time might show that some additional recovery might be effected by standard and present used methods and processes. But should all the devices for the recovery of wastes be employed that are in operation at present in the most complete plants for the manufacture of pulp and paper, there would still be considerable loss of pulp stock and the condition of the stream would probably not be materially improved.

It would seem that the use of a series of multiple screens graduating in size from those through which the pulp-carrying waste water is now passed to still finer screens, thus preventing clogging of the screens and interruption of the processes at the mills but effecting the removal of the finer pulp fibres, might be found practicable and might very materially reduce the loss in pulp and paper manufacture as at present carried on. Aside from such a method of preventing the injury to the stream by the vast amount of wood fibre now discharged into it, such injury would be prevented by conveying the pulp-carrying waste water to gravel filter beds or some other type of disposal work on the bottom lands below the city. This would require the construction of a large outlet sewer to receive the liquid wastes from the several plants.

With respect to the waste sulphite liquor from the sulphite pulp process — which process contributes a very large proportion of the total weight of polluting matter thrown into the stream — it should be stated that no feasible or commercially possible methods of disposing of such wastes has as yet been devised. It is likely that in any project to treat the wastes from the mills it would be necessary to arrange for a separation of the waste liquor from the sulphite pulp mill, on account of the difference in the character of this waste from the other classes of wastes, although, as noted above, no known methods of treatment, that are not prohibitive in cost, are available for the reduction of the sulphite liquor.

Another point to consider in suggesting a means of caring for the wastes from the plants is, as far as could be noted during the brief inspection of conditions in the city and along the stream, that until the bottom lands below the city are reached no readily available site exists along the stream for a sewage disposal plant to treat the entire sewage of the city when the separation and treatment of the sewage of the city or the treatment of the dry weather flow in the sewers shall be required. The same is true in a lesser degree in respect to available sites for individual plants to treat the wastes at the various mills.

If all the waste-carrying water from each plant was discharged into a trunk sewer the amount of water diverted from the stream and thus lost for use in the production of power at the various mills, based on amounts of such waste waters estimated by the manufacturers at seven of the largest plants, would equal 5 per cent. or 6 per cent. of the total flow of the stream. For this reason it would be necessary to decrease as much as possible the amount of such waste water.

The volume of manufacturing wastes to be carried by a trunk sewer would be several times the volume of the sanitary sewage of the city and the character of the wastes as compared to the sewage would undoubtedly preclude the possibility of treatment in one plant.

It is evident, therefore, that any improvement in the condition of Eighteen Mile creek must be looked for along the lines of removing from the stream the wastes from the industrial plants and the sewage of the city of Lockport now discharged into the stream either directly or by first being discharged into the Erie canal and then by overflows reaching the stream. The conditions here, as on the upper Hudson and other streams of the State, present difficulties. The sanitary sewage is only a relatively small proportion of the industrial sewage and the problem of remedying the conditions will depend largely upon the success of reducing the latter class of wastes.

The characteristics of sewage and trade wastes are entirely dissimilar and separate treatment would be necessary while, as pointed out above, the variation in character of different classes of the trade wastes discharged would undoubtedly require two separate processes of reduction of such wastes on grounds of practicability and economy.

While it is entirely feasible to effectively dispose of sanitary sewage, a problem confronts us with respect to the industrial wastes. Undoubtedly certain classes of such wastes can be disposed of by installing better devices such as improved screens. The whole problem of industrial waste disposal, however, requires considerable study and development in the way of experimental and research work.

There is no question, however, as to the effective treatment of sanitary sewage, and since this is the dangerous class of sewage it should be treated. As to the best means of treating the sanitary sewage this can only be settled by a local study. It would seem entirely practicable to intercept the dry weather flow from the present combined sewers and lead this sewage below the city to a suitable site for disposal works.

The four principal manufacturing concerns along the stream from whose plants practically all of the industrial wastes polluting the stream are discharged have complied with the provisions of chapter 468 of the Laws of 1903, in submitting reports to this Department and have not increased their output since the act went into effect except in one instance where an old paper machine was replaced, thereby slightly increasing the total production from this mill. In this instance the increased output does not equal the capacity of the mill as stated in the report referred to above.

The discharge of wastes from these mills is not, therefore, in violation of the above law so that no specific grounds exist for action by this Department or the local board of health to require these mills to cease the pollution of the stream except such action as may be taken under an order by the Governor as provided for in section 6 of the Public Health Law.

There is a decided tendency, however, on the part of riparian owners along the stream in the towns of Lockport and Newfane to commence civil actions against the mill owners for recovery of damages to their properties occasioned by the pollution of the stream by the refuse discharged from the mills. For this reason it would seem that the manufacturing concerns should be willing to co-operate in a movement to effectually dispose of the long-standing complaint against the pollution of the stream.

Recommendations

In view of the foregoing, I therefore recommend:

1. That the matter of treatment of the industrial wastes be taken up by this Department with the various manufacturing concerns and that they be urged to arrange, either jointly or individually for the removal or purification of the wastes now discharged into Eighteen Mile creek.

2. That a communication be addressed to the authorities of the city of Lockport calling their attention to the present pollution of Eighteen Mile creek and that they be asked to take steps to collect and convey to a suitable site and there treat the dry weather flow of sewage from the city.

Respectfully submitted,

H. B. CLEVELAND,
Principal Assistant Engineer

On April 16, 1909, letters were addressed to the city authorities and the various industrial establishments along Eighteen Mile creek inclosing copies of this report, urging the city to arrange for treatment of the dry weather flow of sewage as soon as practicable, and requesting the manufacturers to take such steps as may be necessary for the removal or purification of the wastes discharged from their plants into the stream.

LONG LAKE

ALBANY, N. Y., *September* 30, 1909.

Dr. EUGENE H. PORTER, *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to report that in accordance with your direction and the request of the Association of Taxpayers of Long Lake, and of the health officer of the village, I visited Long Lake for the purpose of inspecting condition of pollution of the lake, and to advise the association and the local board of health in the matter of providing suitable remedies for curtailing and eliminating the sewage pollution now entering the lake.

During my visit I met and conferred with the health officer, Dr. Brannen, Judge Greene, chairman of executive committee, and Mr. Freund, secretary of the association. I also attended a meeting of the local board of health, discussed with them the question of pollution of the lake, and advised them as to the means which should be provided for removing pollution, and the action which should be taken by them generally in improving the sanitary conditions about the lake.

It appears that there are a number of cases of pollution of Long Lake, and, unfortunately, there are of other lakes in this region. This pollution is derived from two general sources; one, the sewage derived from the dwellings and hotels in and adjacent to the village, which is of a more serious nature, owing to comparatively larger volume; the other, the sewage derived from the individual cottages or hotels situated along the shores of the lake.

A considerable portion of the sewage derived from each of these sources is now discharged into the lake in its raw state — that is, directly through drains without any settlement in cesspools or settling tanks. The tendency of the discharge of this raw sewage is to create a nuisance along the shores of the lake, due to the coarse suspended matter which floats upon the surface of the water, and is carried to points distant from the outfalls by the action of currents induced by winds and wave action; or due to the suspended matter which settles upon the bed of the lake in the vicinity of the points of outlet and causes unsightly deposits and, probably, at times, odors.

It is my opinion that the most objectionable phase of the present pollution is the discharge of raw sewage into the lake, and that if the sewage is in all cases clarified by settlement in properly constructed cesspools or settling tanks, the objectionable conditions will be largely, if not wholly, removed. It would in my opinion not be practicable with the existing and growing population on the lake, to make the water potable even if more complete and expensive disposal plants were installed, upon the drainage of every cottage and hotel, and it is important that the people who live on the lake should be advised not to use the lake water for drinking purposes. It is true that the practice of bathing is indulged in quite extensively, but if persons are, while bathing, cautious about not drinking any appreciable amount of the water the danger would be largely negligible.

It is my opinion therefore that the first and immediate steps that should be taken by the residents of the village and along the lake is to free it from the discharge of any raw sewage by the construction of suitable cesspools or settling tanks to retain the coarse suspended matter contained in it. The clarified effluent might under present conditions be discharged into the lake, where through " dispersion " and the " digestive capacity " of aquatic life, it would be quickly dissipated and rendered largely innocuous except for potable purposes as pointed out above.

The condition in the village of Long Lake requires special consideration, and after inspecting these conditions it is my opinion that it would be more expedient and economical in the long run for the village to construct a sewer system. Plans should be prepared, and on a relatively comprehensive scale to include all portions of the village and be presented to this Department for approval as provided by the Public Health Law. It would be necessary to construct only a portion of the system at the present time. A disposal plant should be provided at the outfall and by thus doing the sewage of the community could be more effectively and economically disposed of.

With respect to the individual cottages and hotels along the lake outside the village, it is my opinion that individual settling tanks or cesspools of proper design should be installed. Where the number of people in a cottage is small, and the soil sandy it would be well to treat the effluent by some simple supplementary process such as subsurface irrigation which would prevent any sewage or effluent being discharged at all into the lake. In order to assist in an understanding as to what would be expected in the way of a settling tank, I would suggest sending to the health officer a copy of accompanying table and sketch showing arrangement sizes and capacities of a tank which has been found effective and suitable in other places, and in all probability locally adaptable to conditions around Long lake.

I believe that with a proper spirit of co-operation between the activities of the local board of health and the taxpayers' association a general movement to better the sanitary conditions around the lake can be carried out, and so far as I could learn there was a general willingness on the part of all concerned to remedy any improper methods of sewage disposal if they were informed as to the means by which this improvement could be accomplished. For this reason I recommend that a copy of this report be sent to both the local board of health and to the taxpayers' association, urging upon both the exertion of their influence and powers to induce all individual property owners and the village of Long Lake to provide proper means for collection and treatment of sewage along the lines suggested above.

I should further recommend that the local board of health be especially urged to take the matter up as one of their duties under the Public Health Law, to investigate all cases of pollution of the lake and to take such action within their powers and jurisdiction as will prevent the discharge of all raw sewage into the waters of Long lake, and permit only such sewage as is properly clarified in suitable settling tanks to be discharged therein.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *October* 4, 1909.

MR. GEORGE E. TERRY, *President of the Association of Taxpayers,*
Long Lake, N. Y.:

DEAR SIR:— In reference to the question of protection of the purity of Long Lake referred to in letters received from Mr. John C. Freund, secretary of your association, dated August 31st, and a letter from you dated September 18th, I beg to say that upon receipt of these letters, and as soon as practicable, I directed our Chief Engineer, Mr. Theodore Horton, to visit Long Lake, and confer with members of your association, and the local board of health with a view of lending our assistance in improving the sanitary conditions around this lake.

I am inclosing herewith a copy of the report of our Chief Engineer's visit, and a letter transmitting the same to the local board of health. The report of Mr. Horton outlines quite clearly the condition of pollution of the lake and the practical means for remedying it.

While the powers of this Department are limited concerning the removal of pollution from the waters of this State, I believe that considerable can be done through the local board of health in an official or persuasive capacity, and you will note in my letter to them my recommendations as to the exertion of their influence along these lines.

I wish to assure you of my interest in this matter, of the assistance of this Department so far as it is possible, and to express the hope that through the co-operation of your taxpayers' association, the local board of health and the good citizens who frequent the shores of this lake, this movement for removing pollution will be carried out in a practical and effective way. The suggestions and recommendations of Mr. Horton will be very helpful in this regard, and I believe that, if they are carried out, there should be not only a vast improvement in the condition of the lake water, but, with the limitations stated in Mr. Horton's report, an entire elimination of the objectionable conditions.

Very respectfully,

EUGENE H. PORTER,
Commissioner of Health

NORTH BANGOR

ALBANY, N. Y., *March* 5, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report of an investigation in the matter of an application for a permit to discharge creamery wastes into a stream at North Bangor, Franklin county, by the Franklin County Creamery Company. This matter was also the subject of a complaint by a property owner below the creamery.

An inspection was made by Mr. C. F. Breitzke, inspecting engineer of this Department, on February 15, 1909, accompanied by the complainant, Dr. Henry H. Carpenter of Lawrenceville, and by the health officer, Dr. F. W. McCarthy of North Bangor, the results of which, together with certain studies in relation thereto are briefly outlined as follows:

The Franklin county creamery is owned and operated by the Franklin County Creamery and Condensed Milk Company, a firm consisting of Orlando Harrington, manager, of North Bangor, and of Harry J., Frank D., George C. and James E. Taite of Springfield, Mass. This creamery is located at North Bangor, south and not far from the railroad station of the Rutland branch of the New York Central Railroad.

This creamery handles about 20,000 pounds of milk a day, from which it separates the cream, and manufactures butter and condensed milk. The equipment consists of two receiving tanks of 500 and 600 gallons storage capacity respectively, two centrifugal separators, two cream tanks, one skim-milk tank, 500 gallons capacity, two open vats, one vacuum condensing apparatus, one cooling tank and two butter churns. The cooling water for the condensing apparatus is pumped by an 8-inch x 8-inch x 14-inch National Foundry and Machine Company single acting steam pump having a 4-inch suction and discharge, and a capacity of 240 gallons per minute.

At the time of the inspection the building was clean and in a sanitary condition. The wastes consist of wash water and cooling water from the condensing apparatus. No milk is thrown away.

The cream separated from the milk is either shipped or made into butter according to the demand. The skim-milk and whatever milk is not needed for cream is used for the manufacture of condensed milk. The buttermilk is given away to the farmers.

All milk accepted from the farmers is emptied into a strainer, and passes directly into the storage tanks, the farmers taking away the cans and washing them themselves. The waste water from the creamery consists of the wash water from the apparatus referred to above and from about thirty cans in which the cream and some of the condensed milk is shipped, most of which cans are reported as washed before returning, the water used in the manufacture of butter, small mechanical losses of milk and cream, and floor washings. The water used in the absorbing of steam and formation of a vacuum is slightly discolored by a small amount of milk passing off with the steam. This water, which is quite hot after leaving the condenser, is discharged directly into a small stream tributary to the Little Salmon river, and having a flow of about 0.2 cubic feet per second. This stream has its source in two small springs and flows through flat springy ground.

The condensing apparatus was installed in October, 1907. A dam was built across the small stream, and during the summer of 1908 practically all the flow of the stream was pumped through the condenser, leaving the flow below the dam a stream of hot water discolored by milk. This caused a nuisance along the course of the stream, and was made the ground for the complaint. It appears, however, that conditions during the past summer have been a great improvement over previous years. Before the installation of the milk condensing apparatus, for a period of about twenty years, this creamery was used largely for the manufacture of butter, the farmers being paid only for the butter fat in the milk delivered at the creamery by them and taking away the skimmed milk and buttermilk with them. In the spring of the year, however, before the farmers began to raise calves and hogs, much of the skim milk was left at the creamery and emptied into the stream. Since the condensing apparatus has been installed, however, all of the milk is bought from the farmers, and what is not needed for cream is condensed, there being no waste except wash water and mechanical losses.

It is now proposed to pump water from artesian wells and not to draw on the flow of the stream for water supply, and thereby almost double the flow of the stream. From computations, however, based on the flow of the stream under these conditions, the amount of putrescible matter in the wastes and the comparatively high temperature of the water in the stream after the heated water from the condensing apparatus is discharged into it, it does not appear that there will be enough available oxygen present to prevent a nuisance if all wastes from the creamery are discharged into it.

On account of the prohibitive cost, it is also out of question to build a settling tank large enough to treat all of the creamery wastes. Fortunately, however, the wastes can be separated, and treatment is necessary for only a small portion of these wastes, since they consist of a large amount of only slightly polluted condenser water and a small amount of water containing practically all the creamery wastes.

Summarizing briefly the results of this investigation as outlined above, I would conclude that:

1. The wastes discharged into the small stream at North Bangor by the Franklin County Creamery Company consist largely of cooling water from the condensing apparatus, and in part of wash water and small mechanical losses of milk. The former is slightly discolored by constituents of milk that escape with the steam from the vacuum pan, but its organic content is practically negligible. The temperature of this water is quite high, however, and interferes with the oxidizing power of the water of the stream into which it is discharged. The latter is comparatively small in volume, but contains practically the organic wastes from the creamery.

2. Since October, 1907, when the manufacture of condensed milk was commenced all milk received at the creamery with the exception of buttermilk, which is limited in amount and is given to the farmers, is prepared for market. Previous to this time, for a period of some twenty years, especially in the spring when the farmers had not many calves or young pigs to feed, skim milk was thrown away and discharged into the stream.

3. Consequently, owing to the changes made, the pollution of the stream has been largely eliminated and during the past summer, as far as offensive odors have been concerned, the nuisance has been largely abated, the complaint being due rather to the high temperature of the water in the stream and the reluctance of cattle to drink it.

4. A dam was built across the small stream and practically all of its water was used for absorbing the steam from the condensing apparatus, the water being turned back into the stream hot. Steps, however, are now being taken to secure all the cooling water from artesian wells. The flow of the stream will accordingly be greatly increased, and the temperature of its water below the creamery will be much lower than last summer.

5. The wash water can be separated from the cooling water from the condenser. If this is done, and if the wash water is properly treated in settling tanks and given a 12-hour retention before being discharged into the stream, the nuisance will be very largely abated, and further treatment may not be necessary.

6. Since the volume of these wastes can by careful management be kept small, the cost of construction of a settling tank for their treatment will be slight.

It would seem, therefore, that in view of the facts and studies outlined above, the Franklin County Creamery Company should be required to install a settling plant of suitable size similar to that outlined in the accompanying sketch suggestive of the type. If the separation of condenser water and wash water is made, and care taken to prevent the addition of raw, skim, or buttermilk, to the wash water, a tank having a capacity of one-half the maximum daily volume of the wash water ought to yield satisfactory results.

In conclusion, therefore, I would recommend that a provisional permit be granted to the Franklin County Creamery Company allowing the discharge of the cooling water from the condenser, and the effluent from a properly constructed settling tank into this stream at North Bangor, Franklin county, tributary to the Little Salmon river.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

On March 9, 1910, a letter, inclosing a copy of this report and a permit issued to the Franklin County Creamery and Condensed Milk Company, was addressed to the manager of the company. This permit allowed the discharge, into a tributary of the Little Salmon river, of cooling water from the condensers and effluent from a proposed settling tank. The permit provides that the only waste to be passed through the settling tank shall consist of wash water from floors and utensils and the waste water from the butter-making process.

PIERMONT

ALBANY, N. Y., *November* 8, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report of an investigation of insanitary conditions at Piermont, alleged to be due to the dumping of wastes by the Piermont Paper Company.

On November 3, 1909, Mr. C. F. Breitzke, inspecting engineer of this Department, visited Piermont and investigated the conditions complained of. He found that the wastes above referred to were beater wastes, which apparently do not contain putrescible organic matter and were free from offensive odors. They are, however, dumped on low ground north of the mill buildings within the reach of tidewater, which tends to scatter some of these wastes along adjacent properties, and it is evident, therefore, that these wastes should be dumped well back from highwater mark.

A public nuisance, affecting, however, the property of Mr. Tilt, was found to exist, due to the discharge of sewage from two 18-inch drain outlets serving a thickly settled section. These drains discharge into an open ditch about 3.5 feet wide, which flows northerly for about 200 feet into a cove of the Hudson river at a point about 100 feet distant from Mr. Tilt's residence. This ditch is a stagnant, septic pool. It has no flow other than that due to the rising and ebbing of the tide, which carries some of the sewage out into the cove, forming deposits of black, slimy sewage mud on the shore of the cove about seventy-five feet from Mr. Tilt's residence.

Piermont is an incorporated village in the southeastern part of Rockland county, having a population of about 1,200. It is for the greater part situated on steep hilly ground, sloping from the Hudson river west to 300 feet or more above sea level. A large portion of the population live on low ground, adjacent to the Hudson river, the top of the hill being only sparsely settled. There are about nine miles of streets. Owing to the fact that an abundant supply is obtained from wells and springs, the village has no public water supply.

The drain outlets referred to above have for a number of years been receiving sewage and drainage from a congested district along Piermont avenue between the railroad crossing and Ash street, near the center of the village. On account of the nuisance caused by the insanitary conditions described above, on August 21, 1908, property owners in this section of the village, acting on the advice of the village board of health, petitioned this Department for permission to construct temporarily through this section a private sewer to discharge directly into the Hudson river.

This petition was granted on October 5, 1908, but owing to the fact that the permit is revocable at any time, the property owners decided not to proceed with the construction of this relief sewer.

The entire village appears to be badly in need of sewerage. Some sections have obtained temporary relief by having private sewers draining to tidewater. While there is no public water supply, a large portion of the houses are supplied with running water from private springs, and consequently there is a large amount of liquid waste to be disposed of. Conditions are such that cesspools no longer furnish a suitable means of sewage disposal, and it is evident that the village should without delay adopt some comprehensive plan of disposing of its sewage.

In view of the foregoing, therefore, I beg to conclude as follows:

(1) The immediate cause of this investigation — the dumping of beater wastes near their mill by the Piermont Paper Com-

pany — does not constitute a public nuisance, although these wastes should be preferably kept away from tidewater.

(2) There is, however, an offensive and public nuisance at this point which affects the property of Mr. Tilt, due to the discharge of sewage from drains receiving wastes from a thickly settled portion of the village, into an open ditch.

(3) The proper abatement of this nuisance can be accomplished only by the proper construction of a proper outfall sewer leading sufficiently out into the river to prevent the deposition of sewage material along the shore.

(4) Aside from the consideration of this local nuisance, the village of Piermont is badly in need of sewerage facilities, and a sewer system with proper means of disposal should be provided without delay. Its installation should meet not only the general requirements of the village, but would also remove the cause of the nuisance referred to above.

I therefore recommend that a copy of this report be sent to the village board of health and that they be advised that:

(1) In regard to the complaint of Mr. Tilt, although the conditions complained of by him do not constitute an offensive nuisance, it is essential that the beater wastes be kept back sufficiently from the water's edge so as not to be carried by tidal action to the adjacent shores.

(2) The discharge of sewage into an open ditch near the paper mill and at the foot of Ash street is an offensive and public nuisance and should be abated without delay.

(3) As a result of this nuisance, and owing to the need for better sewerage facilities in the village, it is very desirable, if not necessary, that a proper system of sewerage be installed.

The needs of the village of Piermont with respect to sewerage were the subject of considerable correspondence between this Department and the village board of health in 1908, and in letters addressed to Mr. B. B. Morrow, president of that board, on May 22, 1908, and June 13, 1909, the position of this Department in the matter was clearly outlined.

At that time it was pointed out that plans should be prepared for a sewer system including all the streets in the village and submitted to this Department for its approval. If it is desired to defer the construction of any portion of the system, at the time of the submission of the plans an application and statement should also be submitted as to the portion of the system which it is proposed to construct at once, whereupon the approval of this Department may be given both in regard to the approval of the entire plans and of the construction of the portion requested.

I believe that, if this advice is followed by the village board of health, the present nuisance will not only be satisfactorily abated, but the solution of their sewerage problem will also be facilitated.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

Copies of this report were transmitted to the complainant and to the local board of health on November 12, 1909.

ALBANY, N. Y., *November* 12, 1909.

MR. B. B. MORROW, *President, Board of Health, Piermont, N. Y.:*

DEAR SIR:— I am inclosing herewith a copy of a report by the Chief Engineer of an investigation of insanitary conditions at Piermont made the basis of numerous complaints to this Department.

You will notice from this report that an offensive and public nuisance exists in your village, due to the discharge of sewage from drains receiving wastes from a thickly settled portion of the village, into an open ditch in the rear of the Tilt property; also that aside from the consideration of this nuisance in particular, the village of Piermont is badly in need of sewerage facilities and a proper system of sewerage should be provided without delay. I beg to state that the recommendations contained in this report meet with my approval and I hope that your board will give them immediate and careful consideration.

I shall be pleased at any time to discuss with you any of the matters to which reference is made in the report, and I beg to extend to you as far as possible the co-operation and assistance of this Department in improving the sanitary condition of your village.

Very respectfully,

EUGENE H. PORTER,
Commissioner of Health

WEST ALBANY

ALBANY, N. Y., *March* 24, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to report on the investigation of an alleged nuisance created by the pollution of Sand creek, tributary to Patroon's creek from the discharge of wastes and blood from the slaughter-house operated by Bennett Brothers near West Albany in the town of Colonie and complained of to this Department March 23, 1909, by Hannah Espenlaub.

The records of the Department show that a similar complaint was made by Hananh Espenlaub, which complaint was investigated by this Department, April 24, 1906. The local board of health was instructed to abate the nuisance with the result that, Dr. H. G. Abrams, health officer of the town of Colonie, reported on June 28, 1906, that Bennett Brothers had built a sedimentation basin and no longer sewered into Sand creek.

Hannah Espenlaub again complained of intermittent pollution of the stream by wastes from the same slaughter-house during May, 1908. The local board of health was directed by the Commissioner on May 11, 1908, to take such action in the matter as to avoid future complaints and if necessary to bring an action against Bennett Brothers for the penalties incurred for polluting this stream. In reply to these instructions J. C. Brewster, clerk of the board of health of the town of Colonie, reported June 6, 1908, that a portion of the drain from the slaughter-house to the creek was dug up and destroyed in the presence of the Health Officer and that in the opinion of the Board of Health there would be no further trouble.

The last inspection of Sand creek and Bennett Brothers' slaughter-house was made by Mr. C. A. Holmquist, assistant engineer of this Department, March 23, 1903, in company with Judge William Volk, member of the local board of health.

Sand creek is a small stream about two-thirds of a mile long, formed by the overflow from the West Albany reservoir. It discharges through a culvert under the New York Central tracks and yards into Patroon's creek which is said to flow as a covered sewer to the Hudson river.

The slaughter-house drain discharges into Sand creek about 500 feet below the spillway of the reservoir. Although there was no discharge from this drain at the time of the inspection there was evidence of such discharge in the form of fleshy material caught on twigs and weeds in the creek as well as the disagreeable slaughter-house odor which was noticed as far as the lower line of Hannah Espenlaub's premises, through which the stream flows, and below which point this distinctive odor was lost. This was owing, doubtless, to the additional pollution caused by the discharge of numerous drains carrying household, industrial and barnyard wastes which converts the stream into a very foul open sewer as far as the New York Central tracks. The only pollution, however, between the reservoir and Hannah Espenlaub's property is that caused by the slaughter-house and a drain from the property of John Glavin.

The slaughter-house is located about 600 feet from the stream and at an elevation of about thirty feet above the creek. The sanitary conditions in and around the slaughter-house were not the best which was probably due, somewhat, to the inconveniences under which they were working owing to extensive reconstructions of the plant underway.

Mr. Bennett, one of the proprietors of the slaughter-house, stated that the " duty " of the plant varied from 400 to 700 hogs and from forty to sixty cattle per week. Most of the blood from the hogs is caught in a large iron kettle and sold. Most of the fleshy wastes are reduced and boiled in large, closed, steam heated, iron retorts to extract the grease which is put into barrels and sold. The residue is also sold to farmers as fertilizers. Other wastes from the entrails of the cattle and coagulated blood are put into boxes and hauled away by farmers for fertilizers. The wastes which reach the creek consist of scalding water used in removing the bristles, the water used for washing out the hogs after scraping and removing the entrails and waste blood and flesh washed into the drain in cleaning up the floors of the killing rooms. These wastes are conveyed to a shallow pond, formed by making a small embankment outside of the slaughter-house, where it can be retained by closing the entrance of the sewer by means of a gate and from which it is discharged periodically into the creek.

Mr. Bennett stated that these wastes are all taken up by the sandy soil when the ground is not frozen, but since this is impossible in the winter, that portion of their sewer leading to the creek, which was destroyed by order of the local board of health in 1908, was relaid last autumn.

It seems conclusive that it will be impossible to satisfactorily dispose of the liquid wastes heavily impregnated with a large proportion of putrescible animal matter by impounding it in a comparatively small space without creating a nuisance, because the interstices of the sand will soon become filled when filtration will cease and this decomposing mass must then be discharged into the stream which, as Judge Volk stated, is dry during certain dry periods of the summer. This condition would be worse than to allow the fresh wastes to be discharged each day. This practice is now complained of by Hannah Espenlaub as creating a nuisance even though the water in Sand creek is comparatively high at present.

The nuisance created by the discharge of wastes from the slaughter-house into this stream has been complained of to this Department from time to time for the last three years. Each time Bennett Brothers have been directed, through the local board of health, to abate the nuisance, which directions have only been carried out temporarily so that in my opinion effective steps should be taken to abate the existing nuisance inasmuch as wastes from the slaughter-house are being discharged into Sand creek in direct violation of chapter 468 of the Laws of 1903.

There are several ways of abating the nuisance, one of which is to lay a sewer from the slaughter-house to the culvert under the New York Central tracks that could also be used by persons living along the line, and towards the construction of which Mr. Bennett stated that he would contribute $1,000. This method would abate the nuisance and at the same time help to divert some of the domestic drainage now discharging into Sand creek if lateral connections were made by persons now discharging into the creek but may not be desirable on account of delay and possible inability to obtain right of way, co-operation with the town authorities, etc.

Furthermore, the construction of this sewer would simply result in changing the pollution from one stream to the other and would in no way be a final disposition of the question of pollution since this Department may, at any time, require treatment of such wastes, as well as of other refuse now being discharged into Sand creek, should such treatment become necessary by reason of the condition of pollution of Patroon's creek.

Another way to abate the nuisance would be to require Bennett Brothers to construct a settling tank to provide for preliminary treatment to be followed by subsurface irrigation on their own premises. The elevation of the slaughter-house and the condition of the soil are such as to make this method very feasible and such a disposal plant, if properly constructed and operated, should produce an effluent of stable quality both in winter and summer and satisfactorily care for the liquid wastes.

I, therefore, recommend that Bennett Brothers be requested to prepare plans for a disposal plant to provide for settling tank treatment to be followed by subsurface irrigation or any other method that will produce an effluent of equal purity and to submit such plans to this Department for approval on or before June 1, 1909.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

On April 9, 1909, a letter, enclosing a copy of this report, was addressed to Bennett Brothers, requesting that they submit to this Department on or before June 1, 1909, satisfactory plans for disposing of the liquid refuse from their establishment.

The plant was reinspected on June 7, 1909, by the engineering division and it was found that a large wooden tank 8 x 16 x 6 feet deep was located about 100 feet from the main building to receive the liquid wastes, and another tank or box of about half the area and some three feet deep was located nearby to receive the solid waste from the establishment. A tile drain leads from the building to the tank first referred to, which has no outlet, although a tile drain has been laid for a distance of perhaps 200 feet, the end of which is now closed for the purpose of making a connection with a future sewer which it is proposed to construct by the town of Colonie or the village of West Albany.

The method of disposal has thus been changed from a discharge into the creek to one of disposal as follows:

All the solid matter such as entrails, thick blood, grease particles, etc., is removed by a barrel from within the building to the smaller box, from which it is hauled by farmers for use as fertilizer. The liquid wastes containing the washings of the floors, dilute blood, wash water from the scalding of the hogs and the liquid wastes from the grease digesters are discharged into the larger tank, from which it is pumped by hand into kegs and transported to farms in the vicinity, where it is discharged upon land for fertilizer purposes.

As the plant is now operated, no wastes discharge into the creek, and it is expected that there will be ample demand by the farmers in the vicinity for these waste products, so that they will all be taken care of as fertilizer. It is arranged that in case there is a surplus from what is needed by the farmers that the wastes shall be discharged on land owned by the Bennett Brothers or on a filter area to be prepared for that purpose.

There was no nuisance existing at the time of the last inspection and no pollution of the stream, so that all cause for complaint has been removed.

In addition to the foregoing, the following cases of stream pollution were examined into and advice was given through correspondence in the matter of abatement of nuisances arising from stream pollution at the following places:

Akin
Akron
Albion
Alden
Bemus Point
Buffalo
Busti
Canisteo
Castile
Chappaqua
Charlton
Chazy
Cherry Valley
Childwood
Clarkson
Clyde
Cobleskill
Coeymans
Cohoes
Copenhagen
Corning
Cortland
East Meredith
Ellenville
Fishkill-on-Hudson
Geneva
Gowanda
Greenfield Center
Jefferson
Jeffersonville
Johnstown
Lackawanna
Lake Huntington
Manlius
Middleport
Mohawk
Mount Morris
Napanoch
New Kingston
Ontario Center
Oyster Bay
Phœnix Mills
Port Jefferson
Rye
Sloanville
South Lima
Stillwater
Thousand Island Park
Utica
York Center.

INVESTIGATION OF PUBLIC NUISANCES NOT ARISING FROM STREAM POLLUTION

INVESTIGATION OF PUBLIC NUISANCES NOT ARISING FROM STREAM POLLUTION

Although by far the larger number of nuisances which occur in the State are caused by the pollution of our streams, there are, however, a great many which have their origin in other conditions and surroundings. Many of these are of minor importance and should not be referred to the Department but should be handled by the local board of health who have ample power under the Public Health Law to abate them. All complaints which are received are promptly acknowledged and properly referred to the local health officer for investigation if they are of lesser importance and fall properly within his jurisdiction; or are taken up and investigated by the Engineering Division and action taken upon them by the Department, if they are of such nature, magnitude or importance as to require the action of State authority.

Although a classification of these nuisances is impracticable, the ones which more particularly require the attention of the Engineering Division are in relation to improper disposal of garbage, insufficient drainage of swampy and low areas and insanitary conditions in communities arising from inadequate sewage facilities. Allusion to only the more important of these cases will be made.

AMAGANSETT

ALBANY, N. Y., *September* 7, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report of an inspection of the plant of the Atlantic Fertilizer and Oil Company, located on Gardiner's Bay near Amagansett, Long Island:

The inspection was made by Mr. C. A. Holmquist, assistant engineer, on September 3, 1909, in company with Dr. David Edwards, health officer of the town of East Hampton, and Mr. George Hafer, jr., vice-president of the Atlantic Fertilizer and Oil Company, numerous complaints having been received by this Department from the Gardiner's Bay Company stating that the Fertilizer and Oil Company were creating a nuisance by the discharge of fish and wastes into the bay and by the discharge of fumes into the atmosphere.

The plant which was burned about two years ago has been rebuilt and was put into operation June 23, 1909, and is now handling about 3,000 barrels of fish a day in the process of extracting the oil and converting the refuse or scraps into fertilizer. About 200 men are employed at the plant and about 200 more on the fishing boats.

The process of manufacture is briefly as follows:

The fish are conveyed from the boats at the dock by means of buckets on an endless chain and automatically distributed in large receiving bins. The fish are received in the evening and it was stated by the superintendent that they are used the following day.

From the bins the fish are transferred to long horizontal cooking tanks provided with worm gears. Steam is admitted at the bottom and the fish are thus cooked in passing through the tanks which requires about three minutes. No steam nor fumes were seen escaping from these tanks since they are enclosed and the steam is condensed.

The cooked fish are raised by means of elevators into receivers or hoppers above the presses where the oil is squeezed out and run into tanks called separators and the scraps transferred to the scrap house by conveyors and treated with about 4 per cent. of sulphuric acid in order to preserve them if they are not to be dried immediately.

In the separating tanks the mixture of oil wastes and water is heated with steam. The oil which rises to the surface is skimmed off and boiled to preserve it. The residual water from the separating tanks is discharged through a closed trough into a grease trap under the wharf about 150 feet from the shore. This trap consists of a wrought iron bottomless cylinder about five feet in diameter and extends above and below the surface of the water in the bay. Grease and scum are skimmed from the surface and the water escapes under the lower edge below the surface of the water. No scum or grease was noticed outside of the trap.

There is, however, a yellowish discoloration of the bay near the trap which is visible for a distance of about fifty feet.

The scraps or solids which result from the pressing of the fish are worked into fertilizer and are fed into long, cylindrical, horizontal, wrought iron dryers where the scraps are dried by forcing a blast of hot air through the cylinders.

The fumes and steam from these dryers are forced through a series of towers called scrubbers, streams of water in the form of spray descend through the fumes and steam in order to condense them and precipitate the offensive substances to the bottom of the scrubbers. This water is discharged into the bay and although dark in color does not seem to contain any substance that will float on the water or will subsequently deposit along the shore, but disappears a few feet from the end of the sewer. The steam, fumes or gases which escape from the scrubbers are of a light yellow color and disappear about fifteen or twenty feet from the last tower of the scrubbers. These fumes have a characteristic strong fish odor but are dissipated in the atmosphere and grow less intense with the distance from the plant. While the odors were not particularly disagreeable at the time of the inspection they would probably be a great deal worse under certain atmospheric conditions or when the scrubbers do not operate properly. In order to more thoroughly eliminate the odors from the dryers the fumes should be passed over hot coal fires after passing through the scrubbers before being discharged into the atmosphere.

It was noticed at the time of the inspection that large quantities of undried scraps had been allowed to accumulate in and around the storehouse near the dryers. This seems to be an objectionable feature and should not be allowed as disagreeable fish odors arise from this material. It may be necessary to install an additional dryer in order to keep the supply down as low as possible. It was stated that the scrap had been allowed to accumulate before the scrubbers were put into operation, since it was the custom to close down the dryers when the wind was in the direction of the village or when complaints were received.

The condition of the room under the fish presses was insanitary owing to the fact that oils, wastes, etc., run down from above and saturate the floors and ground. This could be remedied by putting in a concrete floor provided with a drain and connecting this with the sewer leading to the grease trap so that the floor could be cleaned after each day's run.

It was also noticed that the sewer leading from the separating tanks to the grease trap leaked, allowing some of the wastes to flow over the ground a short distance to another section of the sewer.

It was stated by the health officer that he received a complaint on July 31, 1909, that some fish had washed up on the shore a considerable distance from the plant and were creating a nuisance. He immediately investigated the complaint and found that it was caused by some difficulty with the elevator which takes the fish from the boats and that some had dropped between the boat and the dock. He notified the superintendent who had the fish buried immediately. At another time the health officer found that the oil and gurry tanks had overflown and contents run into the bay. This was remedied by putting in additional tanks according to his suggestions.

The health officer also stated that whenever he has received a complaint against the company he has ordered them to improve the conditions so as to prevent the creation of a nuisance and that his orders have always been carried out as quickly as practicable.

Mr. George Hafer, jr., vice-president of the Atlantic Fertilizer and Oil Company, stated that the company had spent a great deal of money on their scrubbers so as to prevent the creation of a nuisance and that they were willing to make any reasonable improvements that might be suggested.

The houses on the property of the Gardiner's Bay Company are located about two miles from the Atlantic Fertilizer and Oil Company and it seems highly improbable that the odors and fumes will carry that far providing that the scrubbers are properly operated.

Although the process of manufacturing oils and fertilizer from fish is necessarily accompanied by features more or less objectionable the inspection showed that the company has done a great deal to prevent the creation of a nuisance from the dryers and discharge of wastes into the bay. In order, however, to place this plant in a more thorough sanitary condition and remove all of the existing insanitary features in and around it which tend to, and at times undoubtedly do, produce a nuisance, it is essential that certain improvements be made at once. Some of these will involve additions or changes in construction and some involve maintenance and operation of the plant. Among the more important of these improvements are the following:

1. Special precaution should be taken in the unloading of fish at the dock so that none fall overboard to be subsequently driven ashore by the wind or tide.
2. A concrete floor should be installed under the presses.
3. The sewer from the oil and gurry tanks should be repaired.
4. Special precaution should be taken in skimming the grease trap so that no grease or gurry be allowed to escape into the bay.
5. No gurry shall be discharged into the bay.
6. The undried scraps should not be allowed to accumulate but should be dried as fast as it is produced.
7. Special precaution should be exercised in the operation of the scrubbers so as to make them as efficient as possible.
8. If the present arrangement of the scrubbers does not sufficiently purify the fumes and steam from the dryers they should be further treated by passing them over hot coal fires.

It is my opinion that if these improvements and devices and operation and maintenance are carried out, a material improvement in the sanitary conditions in and around the plant will result, and that the nuisance which now exists, at least at times, will in all probability be largely, if not entirely, eliminated; and I, therefore, beg to recommend that a copy of this report be sent to the local board of health and that they be urged to take the matter up at once with the fertilizer company with a view to having the improvements herein recommended carried out without delay.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

ALBANY, N. Y., *September* 9, 1909.

MR. GEORGE A. MILLER, *President, Board of Health, Town of East Hampton, Springs, N. Y.:*

DEAR SIR:— I am sending herewith a copy of the report of our Chief Engineer, covering an investigation of the sanitary conditions in and around the plant of the Atlantic Fertilizer and Oil Company at Gardiners Bay.

You will note from this report that there are many features connected with the construction and operation of this plant which demand immediate attention in order to eliminate nuisances which now at times arise from this plant, and I would especially call your attention to the recommendations and conclusions therein stated. This report meets with my approval, and I would urge upon your board that you take up at once with the Fertilizer Company the question of carrying out the improvements without delay.

I trust that this will be done without further action by this Department, and I shall be pleased to have you notify me as to the action taken by your board in this matter and as to the progress made in carrying out the improvements recommended in the accompanying report.

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

A copy of this report was also sent to the complainant.

Subsequent advices received by this Department from the local board of health stated that several improvements had been carried out in accordance with the recommendations of this report, and the installation of other equipments progressing, so that it was expected that all of the improvements necessary to put the plant in a proper sanitary condition would be completed at an early date by the Atlantic Fertilizer and Oil Company.

BINGHAMTON

ALBANY, N. Y., *March* 6, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to report on an investigation of an alleged public nuisance created by the burying of dead horses on a plot located in the town of Binghamton, just outside the Binghamton city line, and complained of in a petition signed by sixty-one citizens residing in the city of Binghamton.

The inspection was made by Mr. C. A. Holmquist, assistant engineer of this Department, in company with Dr. Austin W. Cline, health officer of the town of Binghamton.

Several of the petitioners were consulted, who stated that, until a few days before the time of the inspection, a number of horses were lying on top of the ground unburied. This was confirmed upon inspection, which showed that the ground had recently been disturbed, and was admitted by Mr. C. D. Smith of Binghamton, who has a contract with the board of health of the city for disposing of dead horses, cats and dogs, and who said that it had been impossible to bury the horses before that time on account of the frozen condition of the ground.

The burial grounds are located near the edge of and on either side of Park creek between Hawleyton turnpike — an extension of Penn avenue — and Bayles avenue. Hawleyton turnpike is a much traveled road which runs along the top of the precipitous bank about 100 feet above the creek in view of the burial grounds. Bayles avenue extended, although it is not used much by travelers, is located on the right bank only a few feet from the creek. The nearest house is on Hawleyton turnpike, about 200 yards from the burial grounds.

This piece of ground consists of a narrow strip of land with a comparatively thin layer of soil covering the rock stratum which crops out in and near the creek. The thinness of the soil makes it impracticable to get a covering deep enough to prevent the creation of a nuisance.

Although the nuisance has been partly abated by the recent burial of the horses *on the right* bank of the creek, the stench from the other side of the creek, where dead animals have formerly been buried, was almost unbearable and must be even worse during warm weather. This stench is caused by decomposing and putrefying flesh uncovered in places by dogs and crows, the latter being numerous in the vicinity. Over this decayed mass, and running directly into the creek, flowed several rivulets formed by melting snow and springs issuing from the hillside.

It follows from what has been stated above that the place is unsuitable for a burial ground because the soil is too shallow to afford a proper covering and constitutes a public nuisance because:

(1) The dead animals lying on the top of the ground during a part of the year near the public highway is an unsightly spectacle.

(2) The offensive odors which come from the place are very obnoxious and must become very objectionable, under certain atmospheric conditions, to persons who are obliged to use the public highways.

(3) The stream is polluted by leaching.

(4) The stream is polluted by water running over and through this putrescible matter on its way to the creek.

I, therefore, recommend that this report be sent to the local board of health and that they be advised to abate the nuisance.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *March* 16, 1909.

Dr. AUSTIN W. CLINE, *Health Officer, Town of Binghamton,* 143
Main Street, Binghamton, N. Y.

DEAR SIR:— I am enclosing herewith a copy of the report of our chief engineer upon the investigation made by this Department March 5, 1909, of the nuisance created by the burial of dead horses in the town of Binghamton.

You will note from the conclusions of this report that in his opinion the place is unsuitable for a burial ground of this kind and that the disposal of dead animals in the place and manner described constitutes a nuisance and should be discontinued. It is clearly within the authority of the local board of health to order Mr. C. D. Smith to discontinue the practice irrespective of its sanction by or contract made with any other authority and to proceed according to section 26 of the Public Health Law, a copy of which will be sent to you under separate cover.

I would also advise your local board to order Mr. Smith to further abate the nuisance by covering the present site with one or two feet of soil in case the odors coming from the place become more offensive with the approach of warm weather, or to abate the nuisance by some other means.

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

CATSKILL

ALBANY, N. Y., *January* 25, 1909.

Mr. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.*

DEAR SIR:— I beg to report that on December 21, 1908, I visited the village of Catskill for the purpose of conferring with the local health officials in the matter of the establishment by the board of a smoke nuisance ordinance and for the purpose of investigating conditions in the village respecting the existence of a smoke nuisance.

Interviews were held with Mr. Geo. W. Irwin, president of the board of health; with Mr. Harvey S. Scutt, a member of the board of health and superintendent of the Wiley Manufacturing Company; with several citizens, and with the superintendents and employees of the Kaaterskill Paving Brick Company (W. A. Gery, lessee), the Wiley Manufacturing Company (as before stated), and the Catskill Illuminating and Power Company.

The Malcolm & Co. knitting mill, on the west side of Catskill creek and at some distance from the main portion of the village, was not in operation at the time of the visit, and is not likely to be a large factor at any time in the creation of a smoke nuisance in the village.

In addition to the above manufacturing plants, the operation of trains on the Catskill Mountain railroad passing through the village has at times been the cause of considerable annoyance from smoke.

The Kaaterskill Paving Brick Company operate a shale brick plant at various times in the past owned by the Eastern Paving Brick Company and by the Catskill Shale Brick and Paving Company. The plant lies between Main street and the Catskill creek in the southern portion of the village.

The shale brick plant was not in operation at the time of inspection, but since the operations at this plant are undoubtedly the principal cause of any smoke nuisance in the village, a short description of the plant will be given as well as a history of former investigations of the nuisance created by the operations at this plant and official action resulting therefrom. The plant is usually operated from the 1st of April until the 1st of December and produces about 60,000 shale brick and 40,000 paving block daily. The brick are burned in eleven kilns, each kiln having ten fires or furnaces on each side.

During 1908 the plant was operated from July to October, inclusive, and the following amounts of coal were used for the kilns and for the boiler plant:

1908	Kilns Ocean Westmoreland gas coal, semi-bituminous *Tons*	Boiler Bituminous coal *Tons*
July	985	213
August	916	218
September	1,493	226
October	1,072	280

The plant not being in operation, no evidence could be obtained except by interviews with residents, as to the effect of the smoke given off from the plant, but it is probable that a decided nuisance would be created by the operation of the plant under certain conditions.

The operations at this plant have evidently produced a serious nuisance since its construction, as a complaint was made to Governor Black on July 21, 1897, by forty residents and property owners of Catskill.

Governor Black referred the matter to the State Board of Health for investigation, a hearing was held and the committee reported that a public nuisance was created and recommended that the Board require the company to construct " a single water tower or smokestack of sufficient height to carry off the smoke, soot and gases given off in the manufacture of brick and that the 240 chimneys be connected with said water tower or smokestack." This report was transmitted to Governor Black on November 19, 1898.

On April 21, 1899, Governor Roosevelt, on receipt of a further complaint from a resident of Catskill, requested the State Board of Health to investigate the matter, and on May 1, 1899, Governor Roosevelt issued an order requiring the Board to make an examination into the alleged nuisance arising from the operations at the shale brick plant and to report the results of the investigation at the earliest convenience of the Board.

The report of the investigation of the Board was made to Governor Roosevelt on or about June 30, 1899, and after declaring the operation of the shale brick plant to constitute a nuisance injurious not alone to the enjoyment of the property rights of the people but to the public health as well, recommended that the nuisance then created by operation of the plant be ordered abated on or before August 1, 1899.

On July 29, 1899, Governor Roosevelt ordered the Eastern Paving Brick Co. to abate the said nuisance on or before August 15, 1899, and on August 16, 1899, in response to a request from the Eastern Paving Brick Co. that the order be temporarily suspended, accompanied by a petition to the same effect signed by officials of the county of Greene and prominent citizens of the village of Catskill, Governor Roosevelt extended the time within which the nuisance was to be abated to November 15, 1899.

On July 18, 1900, a committee of the State Board of Health, in response to a request of Governor Roosevelt that a further investigation of the nuisance be made, held a hearing in Catskill in the matter and later reported to the Governor that from reports of the experts employed by the company it appeared that it was impracticable from an engineering standpoint to erect a single stack of sufficient size to receive the smoke and gases from the 240 chimneys.

The report also stated that evidence was offered by persons connected with the company to the effect that pipes for the consumption of smoke and gas had been tried in some of the kilns and had proved unsatisfactory, but that at an expense of nearly $1,000 a month, the company had substituted a practically smokeless coal for that which had hitherto been employed in the kilns, and that all parties agreed that there had been far less smoke during the season than before the new quality of coal had been adopted as a fuel.

Plans were at that time presented to the Board by the company for a system of four stacks 100 feet high and the company offered to install one stack and, if the operation of this stack was satisfactory to the State Board, to construct the additional stacks. The State Board recommended that an extension of time be granted and that the company make a trial of the new 100-foot stack, the same to be inspected by the Board when completed.

On December 6, 1900, Dr. F. C. Curtis of this Department reported an inspection of the plant subsequent to the completion of one of the 100-foot stacks caring for forty individual stacks, and said in part as follows:

" I should say then that the smoke nuisance is in good measure relieved, at least under the condition of quality of coal and method of applying it to-day. The improvement over the immense volume of smoke and steam pouring from the large number of small chimneys is very great.

" The situation of the kilns, at the foot of a precipitous elevation fifty or seventy-five feet below the street which has dwellings closely along it nearby, is such that the new chimney does not reach the top of many of these dwellings. They would be better protected from the smoke that is to some extent given off if the stack were fifteen or twenty feet higher. * * * However, the improvement effected by the present 100-foot stack is fairly satisfactory, and the smoke nuisance may be said to be practically abated so far as applied to two of the kilns and will be equally effective for the rest."

Prior to the time of the recent inspection four additional 100-foot stacks had been constructed.

The Catskill Illuminating and Power Co., whose plant is located opposite the center of the village between Main street and Catskill creek, besides furnishing electric light and power, manufacture 35,000 cubic feet of coal gas daily in winter and somewhat less in summer.

The former plant is operated in connection with two water-power plants west of the village and the steam plant in the village is at times not operated to any extent for one or two months at a time, depending on the stream flow. During the week of December 14, 1908, the steam plant was operated every other night. When operating at full capacity the steam plant burns from 1,500 to 2,500 pounds of anthracite culm, daily, under four boilers with a combined capacity of 1,000 H. P., Parsons' mechanical stokers being used.

Sometime during the past fall, for a period of two weeks, a soft coal was used, since hard coal ordered had not arrived, and a nuisance was said to have been thereby created; no objectionable conditions were in evidence at the time of inspection, although the steam plant was in operation, and the general opinion is that ordinarily no smoke nuisance is created at this plant.

In the coal gas works, three and one-half tons of gas coal are used daily in the process. The coke produced is taken from the retorts and used as fuel in the furnaces under the retorts, of which there are twelve. No black smoke issues from the plant except for a short time during firing, and the local health officials do not consider that the operations at the gas plant produce smoke in objectionable quantities. The gas is purified in a shaving purifier only. Investigation was being made by the Public Service Commission as to the quality of the gas produced.

The Wiley Manufacturing Co. manufactures knit goods, the plant being located a short distance south of the electric light and gas plants. At this mill 1,500 tons of coal are used yearly. The company is now using soft coal, but Mr. Scutt, superintendent, stated that the company were willing to use hard coal if a general improvement was to be brought about in the village respecting the smoke nuisance, and are planning to install a third boiler so that the use of hard coal under the boilers would be possible in winter as it is now in summer. The necessity of heating the mill in winter and the enforced use of cold water for the boilers at such season, tax the present boiler capacity, so that quick-burning soft coal must be used.

The Catskill Mountain railroad ordinarily burns soft coal on engines, operating on the road and on the branch at the brick plant, and it is said that at times a nuisance is created. President Irwin stated that lately the railroad company had purchased a harder coal and less smoke nuisance has resulted from the operation of the three or four trains daily.

The local board of health desires to frame and enact a general ordinance to prevent the creation of a smoke nuisance by operations at any and all manufacturing plants in the village, and intend to enforce the provisions of such an ordinance in each case, as occasion demands.

It was agreed with Mr. Irwin, president of the board of health, that the Department would address the board stating the legal powers of the board to enact a smoke nuisance ordinance and to specify and inflict a penalty for any violation of such an ordinance.

The local board have requested and obtained copies of smoke ordinances enacted in various cities in this country and wish advice particularly as to its legal powers under the health laws of this State.

Attached hereto is a copy of rules and regulations of the local board, adopted in 1906, and containing on page 8 an ordinance relating to the discharge of offensive smoke or gas from manufacturing plants.

Respectfully submitted,

H. B. CLEVELAND,
Principal Assistant Engineer

On March 5, 1909, a letter, inclosing this report was sent to the president of the board of health stating that in the opinion of the Commissioner the board of health has authority and jurisdiction to enact an ordinance to prevent the discharge of smoke in such quantities as to create a nuisance or be a menace to the life, health or comfort of the citizens of Catskill.

OLD FORGE

ALBANY, N. Y., *October* 7, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.*:

DEAR SIR:— I beg to report that in accordance with your directions I visited the Fulton Chain of Lakes on September 22d, and made an inspection of the conditions of fluctuations of the lake levels due to the operation of a dam at Old Forge.

This investigation was made at the instance of the requests of residents and property owners situated on the shores of Fourth lake, who complained that, owing to the drawing down of the water level of this chain of lakes through the operation of the gates at the dam located at Old Forge, considerable areas of shore land and vegetation were exposed to the action of the air and sun, producing at times an insanitary condition along these shores; that the shallow water created by the lowering of the water level interfered with the proper use of their boat houses and their floats; and that otherwise their comfort and convenience were considerably affected. They, therefore, requested that the Department make an investigation to determine the sanitary significance and influence of this fluctuation of water levels, and to aid them as far as possible in having the water surface in these lakes maintained at as constant a level as possible.

On the day of my visit I conferred with Mr. Sylvester and other property owners and members of the Fulton Chain Yacht Association interested in this matter, and with them I inspected the condition of the bed and shores of the lake at many places, observing the extent of exposed shores and timber and vegetation areas adjacent to them. I also inspected the dam at Old Forge and conferred with Mr. Woodruff, the keeper, concerning the operations of the gates and his duties concerning the regulation of them.

It appears that the water in this chain of lakes is used for storage purposes for the use of certain mill owners below on the Black river and its tributaries, and incidentally for the purpose of feeding the Black River canal. As a result of this use the water level in these lakes fluctuate according to the season, and the draught made upon the lakes for the purposes mentioned.

In general, in the spring of the year, there is a surplus of water, and the lake level during May and June is at what may be called the highwater stage. Beginning with about July, however, the storage is begun to be utilized, and the lake level is lowered in consequence and in proportion to the need of the mill owners below, which is in turn governed somewhat by the character of the season; during the wet season the water not being drawn down to such an extent as is necessitated during the dry season when the mill owners do not have sufficient water to supply them with power.

At the time of my visit the water level was drawn down about a foot below the crest of the masonry dam at Old Forge, and about eighteen inches below the spring or highwater level of the lake. I was informed that during other seasons the water has been drawn down lower than at the present time, and as much as from twenty-four to thirty inches. It is possible that during the present year the water may have been drawn down considerably below the level observed on September 22d, the day of my visit.

Fortunately, there are few extensive areas adjacent to this chain of lakes which are affected to any material extent by the change in water levels; in fact, only two such areas were pointed out to me — namely, one at the upper end of Fourth lake, near Eagle bay, on the north side of the lake, and the other on the south side of Second lake. Although these were the more important areas, there are, however, other smaller areas at frequent intervals along the shores where the bed of the lake has been covered with a growth of timber and where, by the lowering of the lake and the consequent shallow water, this vegetation is exposed to the action of air and sunlight. Although I noticed no odors nor anything more than an unsightly appearance at the time of my visit, due to the exposure of these shallow timber-grown areas, it was alleged that at times odors arise therefrom.

It is certainly reasonable to suppose that under the action of the sun and air these areas of exposed organic growth may under unfavorable atmospheric conditions produce some odor, and consequently a nuisance. Further than this, the causing of shallow places along the lake shores must increase the growth of vegetation and organisms and tend at least to give rise to objectionable conditions of the areas and adjacent shores. Still further, it is reasonable to suppose that as a result of the lowering of the water levels, not only shallowness of lake results, but it is probable that some small pools are created wherein the propagation of mosquitos may be increased. This cannot be a very important point, however, since the mosquito season is largely in the early part of the summer and the drawing down of the water levels does not begin until late in the summer.

Concerning the influence upon public health in the vicinity of this lake, it is my opinion that the condition of lowering of the lake levels does not materially or directly affect the general health. It must be admitted that the conditions are unsightly, that they do affect the comfort and convenience of the residents, and that they may be the source at times of odors. The predisposing effect upon the public health of this influence can, of course, not be judged accurately, but since these lakes are used largely as summer resorts and for recreation purposes, this predisposing influence of objectionable conditions cannot be overlooked, and it is my opinion that they should be remedied so far as it is practicable.

Upon investigation I find that the supervision and control of the water levels in the Fulton Chain of lakes is vested in the commissioners of water power on Black river, composed of owners of water power along Black river. The Superintendent of Public Works is by virtue of his office also one of the commission, and according to section 50 of article 5 of chapter 54 of the Consolidated Laws "such commissioners are authorized to appoint one gatekeeper for the State dam at Stillwater on the Beaver river, and one gatekeeper for the dams constructed by the State on the Fulton Chain of lakes and Moose river." Further than this, said chapter states that "such commissioners are authorized to make rules and regulations for the management of the gates in said dams subject to the approval of the Superintendent of Pub

Works." Said section still further provides that "such commissioner shall have all the rights and authority of such gatekeepers, and are authorized to regulate the discharge of water through such gates at such times and in such quantities as they may deem proper, but not in such manner as to injuriously interfere with canal navigation or the navigation of that portion of the Black river used for canal purposes."

It would appear, then, that the regulation of the water levels of this chain of lakes is under the control of the commissioners of water power on Black river (of which, I was informed, W. O. Bell of Watertown, is secretary); that said commissioners have full authority to make rules and regulations for the management of the gates in said dams subject to the provisions above stated concerning canal or Black river navigation, but that these rules and regulations are subject to the approval of the Superintendent of Public Works. It is quite possible that the regulation of the water levels of the Fulton chain is largely based upon the requirements of the water power users on Black river, and I am not in a position to state as to how urgent the requirements for storage from these lakes is for such water power purposes. The powers of the commission under section 50 would give them the full right to draw down these waters to any extent that they may deem proper, subject only to the approval of the Superintendent of Public Works.

As to what extent the powers of the Superintendent of Public Works have been used in limiting the amount of storage and consequently the water levels in this chain of lakes, I am not informed, but it would seem from the section of the laws referred to that the Superintendent of Public Works would have some, if not sufficient, power to limit the level to which these lakes may be drawn down for storage purposes. It would seem, therefore, that it might be well to refer this matter with necessary recommendations to the Superintendent of Public Works with a view to having some definite low limit of water level established on this chain of lakes, and to request him to establish such a limit under the powers apparently authorized by section 50 of article 5 referred to above; or at least to secure his co-operation in requesting from the commissioners of water power on Black river that in the interests of the health and comfort of the people who frequent these shores, they establish such a low water level.

As to what such a level should be, it would seem to me from the conditions found during my inspection on September 22d, that a limit of six inches below the present crest of the dam at Old Forge would be a proper and reasonable limit to be set. This would give a fluctuation of approximately one foot in the level of these lakes during the season, if they are operated on the same general plan as they are at present.

Such a fluctuation should cause no deleterious effect of a serious nature to the comfort and convenience of those who reside upon the shores and use the waters of these lakes during the summer resort season.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *October* 13, 1909.

MRS. HELEN SEYMOUR SYLVESTER, *Seymour Point, Fourth Lake, Old Forge, N. Y.:*

DEAR MADAM:— In further reference to the matter of fluctuation of water levels on Fulton chain of lakes which you took up with me in your letter of August 1, 1909, I beg to say that I referred this matter to our Chief Engineer, Mr. Theodore Horton, for investigation, and I herewith enclose a copy of his report of his inspection of the condition of these lakes.

Mr. Horton's report discusses carefully the various factors associated with this question, especially the one concerning public health, and, although he points out that this is not a very significant factor associated with the general question of the water levels of these lakes, it is a significant one in regard to the other questions concerning comfort and convenience which are affected. Mr. Horton points out also that the management and control of the water levels of these lakes is vested in the Commissioners of Water Power on Black river, of which the State Superintendent of Public Works is by virtue of his office a member, and that for this reason any relief from the conditions which now exist must be secured under the present laws through said Commission or through the Superintendent of Public Works.

I have written to the Superintendent of Public Works in this matter, recommending the desirability of controlling so far as possible water levels so that the excessive drawing down of the water will be prevented, and I trust that my services in this respect will be fruitful. I would suggest to you, however, and to the members of the Fulton Chain Yacht Association that you take this matter up directly with the Commissioners of Water Power on Black river or with the State Superintendent of Public Works, who are the proper authorities in this matter, and it may be possible to secure the necessary relief through them.

Assuring you of my interest in this matter and in the health of the residents who frequent the shores of this chain of lakes during the summer and use the same for recreation purposes, and trusting that through my efforts and those which may be exerted by your association the desired relief may be secured in this matter, I beg to remain,

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

ALBANY, N. Y., *October* 13, 1909.

HON. F. C. STEVENS, *State Superintendent of Public Works,*
Albany, N. Y.:

DEAR SIR:— On a number of occasions there has been referred to me the question of excessive fluctuation of water levels in the Fulton chain of lakes by summer residents who frequent the shores thereof, and who complain about the unsightly, insanitary and otherwise inconvenient conditions resulting from the drawing down of the water during the late summer season.

As a result of these repeated complaints I have had an investigation made of these conditions, and I beg to transmit herewith a copy of the report of our Chief Engineer covering his recent investigation. Our Engineer points out the undesirable features associated with the drawing down of the water, recommends the desirability of maintaining a minuimum water level and pointing out the general methods of control of these water levels by the dam at Old Forge to the Commission under whose authority it is vested, and to the fact that you by virtue of your office are a member of the Commission and have the authority of approval of the manner in which these lake levels are controlled.

I beg to ask that you give this matter your consideration and that, after you have read the accompanying report of our Engineer, if you find it possible and expedient to cause the water levels in the Fulton chain of lakes to be maintained at a more constant level, establishing, if possible, a lower limit in general accordance with the recommendations of our Engineer, you will take the necessary action to bring about these changes in the operation of the dam at Old Forge as will prevent the excessive lowering of the water levels in these lakes during the summer season.

Very respectfully,

EUGENE H. PORTER,
Commissioner of Health

In reply to the above letter the Superintendent of Public Works advised the Department that he had no jurisdiction in the matter.

STOCKWELL

ALBANY, N. Y., *July* 29, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report on an investigation of an alleged nuisance created by a mosquito breeding swamp located in the unincorporated village of Stockwell, in the town of Sangerfield, Oneida county, and complained of to this Department by Mrs. A. E. Angell.

The complainant stated in her first letter to the Department that she had appealed to the local board of health for relief but that no action had been taken by them.

A letter from the Department dated June 10, 1909, pointed out to the complainant that the nuisance could be abated through special provisions in the Public Health Law, sections 27 to 30 inclusive, of chapter 45 of the Consolidated Laws, whereby stagnant pools or ponds which may constitute a breeding place for mosquitoes can be drained or otherwise removed through suitable action of the local board of health.

The complainant replied July 19, 1909, that the local board had voted down a resolution based on a petition to abate the nuisance whereupon an inspection was made by the Engineering Division.

This inspection was made on July 22, 1909, by Mr. C. A. Holmquiest, assistant engineer, accompanied by Mrs. A. E. Angell, Mr. K. Stetson and Mr. John Reed, member of the town board of health.

The swamp in question is located near the center of the unincorporated village of Stockwell and adjacent to the public highway. This low piece of ground has an area of about one-half acre, one-quarter of which is on the property of Mrs. A. E. Angell and about three-quarters on the property belonging to Gordon W. Stetson, citizen member of the local board of health.

Towards the north, east and south the ground slopes up from the pond quite rapidly and to a considerable elevation. Towards the west the ground slopes gently across the property of G. W. Stetson to an elevation of about four or five feet above the bottom of the swamp. Beyond this point the land slopes towards the creek across the premises of John Reed.

The drainage area of the swamp is very small except that it receives all the drainage from the adjacent highway which has a steep grade towards the east for about three-eighths of a mile. The drainage from the side ditches of this highway is turned into the swamp or pond through a culvert under a road.

It was stated that this surface water fills the pond to overflowing at certain wet periods of the year when the water attains a depth of four or five feet, and that the water is seldom less than one foot deep. It was also stated that the stagnant water and the decayed vegetable matter in the pond creates very disagreeable odors and that it is a breeding place for mosquitoes which are said to be very thick in the vicinity during the summer.

The insanitary conditions of the swamp and the probability that it is a breeding place for mosquitoes and a source of danger to the health of the community was complained of by Mrs. A. E. Angell, whose house is located within 100 feet of the pond, by Mr. K. Stetson, whose home is within 200 feet of the pond to the north, and by John Reed, whose home is about 250 feet east of this pond.

The pond was formerly drained by a wooden drain about 190 feet long of triangular section. This drain is now clogged and has not been in operation for many years.

At the time of the inspection the weather was exceptionally cold and damp with occasional showers so that the alleged nuisance as to odor and mosquitoes could not be verified. There seems to be no doubt, however, that the conditions complained of produce a nuisance as alleged and that such nuisance should be abated by draining the pond. This could be done at a comparatively small expense either by replacing the old drain with vitrified pipe and extending it about fifty feet farther to connect with an existing drain on the property of John Reed which discharges into the creek, or after relaying the existing clogged drain, to continue it at right angles to this line for about 300 feet and have it discharge directly into the creek. The complainants all signified their willingness to share the cost of draining the swamp. I, therefore, recommend that the Department proceed under section 26 of the Public Health Law (chapter 45 of the Consolidated Laws), and direct the local board of health to take action to abate the nuisance according to the special provisions in the Public Health Law, section 27 to 30 inclusive.

Respectfully submitted,

THEODORE HORTON,

Chief Engineer

ALBANY, N. Y., *August* 19, 1909.

MEDINA PRESTON, M.D., *Health Officer, Town of Sangerfield, Waterville, N. Y.*

DEAR SIR:— On June 10th and again on July 20th I received communication from Mrs. A. E. Angell with reference to insanitary condition of a stagnant pond located in the village of Stockwell adjoining her property.

The conditions were alleged to be a nuisance and she was advised by the Department that, if she cared to take the matter up under the mosquito law, sections 27–30 inclusive of the Consolidated Public Health Law, the matter would be taken up by this Department and referred to your board for action. I have recently had one of our engineers make an inspection of the conditions around the pond complained of, and from his report it appears that this swamp creates disagreeable odors, is a breeding place for mosquitoes and in general constitutes a nuisance. The report states further that the residents adjacent to this pond seem to be almost unanimous in a feeling to have the swamp drained under the provisions of the mosquito laws referred to, and I now wish to place this matter before your board for consideration.

These sections of the Public Health Law referred to outline a very definite procedure which it is the duty of the local board of health to take in matters of this kind, but before any further action is taken by me in the matter I wish to learn whether there are any valid objections for proceeding under the Public Health Law to remove this swamp.

I also wish to have you advise me as to the action which your board may voluntarily take in this matter.

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

ALBANY, N. Y., *August* 31, 1909.

MRS. A. E. ANGELL, *Stockwell, N. Y.*

DEAR MADAM:— In further reference to the matter of a stagnant pool adjoining your property referred to this Department in your letters of June 10th and July 19th, I beg to say that after taking this matter up with the local board of health I have been advised by them that a resolution has been passed by the board providing for the drainage of this land, at the joint expense of the village and the town, each to bear a proportionate expense of one-half, and the total expense not to exceed $100.

It is suggested by the board that by these means the drainage can be secured at a less cost than by the appointment of commissioners under Public Health Law, and if this arrangement is satisfactory to you, please notify me at once to that effect so that an approval may be given for the action taken by the local board of health in this matter.

Very respectfully,

EUGENE H. PORTER,
Commissioner of Health

WATERLOO

ALBANY, N. Y., *September* 15, 1909.

LESTER W. BELLOWS, M.D., *Health Officer, Waterloo, N. Y.*

DEAR SIR:— I beg to acknowledge receipt of your letter of September 13th and to thank you for your report covering your inspection of the conditions of the ditch near Mr. Cox's property resulting from the discharge of refuse from the Waterloo Preserving Company.

I note carefully what you say regarding the creation of the nuisance as a result of this discharge of canning wastes into this stream and, in view of the fact that the delay has occurred in the construction of the proposed sewerage system and disposal works for the village, it is my opinion that the Preserving Company should introduce a settling tank of suitable design and capacity for the purpose of removing by sedimentation the solid and suspended portion of their wastes which are probably largely the cause of the nuisance now created.

I have received a letter from Mr. Maynard of the Preserving Company explaining the situation to me, and I have advised him that I have taken the matter up with you, with recommendations that you take the matter up with them for the purpose of arranging for the installation of the settling tank referred to.

It may be some time — possibly a year or more — before the proposed system of sewers and sewage disposal works are constructed and in operation, and for that reason it is necessary that something be done at once by the Preserving Company to abate the present nuisance that exists. I suggested to Mr. Maynard that a settling tank constructed along temporary lines such as a wooden construction might be the more economical type of structure to build under the circumstances. It would at least mitigate the nuisance under the present conditions and as a temporary expedient might suffice until the new system was in operation.

Trusting that this matter will be taken up by your board and the Preserving Company with a view to having this settling tank constructed and put in operation without delay and that you will advise me as to the progress in carrying out these improvements, I am,

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

Under date of September 20, 1909, N. B. Maynard, general manager of the Waterloo Preserving Company, states that the company will install a settling tank to treat the wastes from the canning factory provided a village sewer system and sewage disposal plant are not constructed before the factory begins operations next year.

WELLSVILLE

ALBANY, N. Y., *September* 27, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I beg to submit the following report on an examination of the public park in the village of Wellsville, made by this Department on September 25, 1909:

This examination was made at the request of the local board of health which stated that this park is annually flooded by the waters of Dykes creek and the Genesee river and leaves the park in a very insanitary condition from the refuse deposited among the trees and underbrush when the water recedes. Mr. C. A. Holmquist, assistant engineer of the Engineering Division, in company with Mr. Wm. Dillon, president of the local board of health, Mr. William R. Van Campen, secretary, Mr. T. J. Egan, mayor, Mr. J. H. McEwen and other members of a committee composed of business and professional men went over the ground with a view of determining what could be done to remedy the condition.

The park is very centrally located, being adjacent to the business section of the village and but a short distance from both Main and State streets. It has an area of about ten acres and is covered with magnificent trees making it an excellent place of recreation for the people of the village as well as a resort for reunions and picnics for the inhabitants of the surrounding country.

Located as it is at the junction of the Genesee river and Dykes creek and between these two streams it is subject to floods and the eroding influence of both, the effect of which is very evident in the condition of the banks especially near the upper end of the park. In some places large portions of the banks have been eaten away, undercutting the trees and causing them to fall into the beds of the streams. If this condition is allowed to continue unchecked it will only be a question of time before a considerable part of the park will be destroyed, since the soil is alluvial and easily subject to erosion. The action is, however, more or less retarded by reason of the protection afforded by the high railroad embankment which bounds the park on the southerly side. The erosion seems to be most rapid just below the railroad bridge across the Genesee and for a distance of about 300 feet owing to the direction of the current at this place.

The magnitude of the floods at this point can readily be deduced from the size of the watersheds and the topographical features of the territory. Geo. W. Rafter in his *"Hydrology of the State of New York"* gives the catchment area of Dykes creek as 68.3 square miles and that of the Genesee river above the mouth of the creek as 214 square miles, a total of 282.3 square miles. In his report Mr. Rafter states that "The upper sections of the Genesee river have a rapid runoff and are subject to sudden and excessive flood-flows" and that the commission appointed by the Legislature in 1865 to inquire into and ascertain the cause or causes of the inundation of the city of Rochester by the waters of the Genesee river considered the chief cause to be the "cutting off the forests and clearing up lands." This condition allows the accumulated winter snows to melt rapidly during spring rains and sudden changes of temperature and the steep slopes of the surrounding hills cause large quantities of water to reach the river channel within a space of three or four days instead of occupying a week or more, as in ordinary floods.

The above conditions of the streams during severe spring freshets were substantiated by the members of the committee interested in the improvement and preservation of the park and these gentlemen stated that during exceptionally severe floods a large portion of the park is covered with water to a depth of four or five feet.

This leads up to a consideration of the insanitary conditions produced by these spring floods; i. e., the deposition of silts and refuse of all kinds among the bushes and trees of the park. It is evident that when the water in the creek rises high enough to inundate the park the velocity of the water is checked by spreading over this large area as well as by the trees and bushes. This allows the heavier particles in suspension to be precipitated. It was stated that when the water recedes the vegetable matter and refuse of all kinds carried down by the streams from the valleys above is deposited in the park and tends to putrify and produce insanitary conditions and possibly a nuisance owing to the proximity of the park to the built-up section of the village, and that in order to prevent these undesirable conditions it becomes necessary to spend a considerable amount of money every year for cleaning up the park after each large flood.

It follows from the above that if it is desired to maintain this park as a pleasure resort something should be done to protect it from the erosive destruction by water and from the insanitary conditions produced by floods.

There are several ways in which this can be accomplished among which may be mentioned such means as earthen dykes and rip rap, wooden piles and planking, stone filled cribs, concrete retaining wall, deepening and widening the channel, etc.

In determining upon what improvements should be made to best protect the park from the ravages of the floods there are several points to be considered among which the following are the more important:

1. The amount of money available for making the desired improvements.
2. What portions of the park should be protected first.
3. The magnitude of floods to be cared for.
4. The effect of ice.
5. The restriction of the water-course.
6. The effect of protection of the park on adjacent lands.
7. The esthetic results produced by different kinds of bank protection.

It is evident from the above that in order to intelligently determine upon what kind of bank protection would be the best, most economical, efficient and esthetic it would be necessary to make a thorough study of all the conditions involved.

This Department has neither the time, facilities nor funds for undertaking through its Engineering Division a detailed study of such a character. It is, further, very doubtful whether a public improvement of this nature is within the jurisdiction of the State Department of Health.

I would therefore recommend that the village authorities be advised to secure the services of a competent engineer to make a complete study of the conditions involved and to make an estimate of the cost of the different methods of protection of the park, in order to determine definitely what is the more desirable, expedient and economical means of undertaking and carrying out the improvement.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *October* 7, 1909.

MR. WILLIAM DILLON, *President Board of Health, Wellsville, N. Y.:*

DEAR SIR:— I am sending you herewith a copy of the report of our Chief Engineer, Mr. Theodore Horton, covering an investigation by the Engineering Division of the condition of the public park in your village.

This matter was referred to me by your Board on July 1st when you requested advice of this Department concerning means for preventing the flooding of your park from the high water in the Genesee river and Dykes creek. The accompanying report, which meets with my approval, seems to outline in a preliminary way, and, in fact, so far as it is possible with the limited resources of our Engineering Division, the scope of the problem and the manner in which it should be taken up by your village and made the subject of a detailed study.

I regret that this Department is not in a position through its Engineering Division to make such extensive studies as this report indicates is necessary, and I earnestly hope that with the suggestions contained in the report you will be able to secure the expert engineering advice necessary to a complete solution of the problem. If there are any points in the report which are not clear to you or any other advice along general lines which our engineer is able to supplement, I should be pleased to advise you further in regard to them.

Assuring you of my interest in this matter and trusting that the accompanying report will be of service to you and at the same time regretting that I am unable to make the necessary studies for a complete solution of the problem before you, I am,

Very respectfully,

EUGENE H. PORTER,

Commissioner of Health

In addition to the foregoing, nuisances were examined into in some cases and advice was given through correspondence in the matter of abatement of nuisances at the following places:

Akin
Akron
Beaver River
Candor
Clarks Mills
Cold Spring
Crown Point
Delhi
East Aurora
East Rochester
Frankfort
Fulton
Griffin Corners
Haines Falls
Lockport
Millbrook
Newtonville
New Paltz
Newton Falls
North Tarrytown
Ogdensburg
Oneonta
Ossining
Patchogue
Peekskill
Perry
Plattsburgh
Portchester
Port Henry
Schaghticoke
Stuyvesant
Tannersville
Yonkers

INVESTIGATIONS ORDERED BY THE GOVERNOR

INVESTIGATIONS ORDERED BY THE GOVERNOR

Under the provisions of section 6 of Article I of the Public Health Law, an order was issued by the Governor calling for a further investigation of the nuisance created in Richmond county as a result of the operations of certain industrial establishments located on Constable Hook in the city of Bayonne, N. J.

A former investigation and report of the effect of the operations of these plants and the extent of the nuisance created in Richmond county and on the Kill von Kull was made during 1908, at which time the conclusion was reached that a nuisance was created by the operation of the plants which affected the health, comfort and property of residents in Richmond county and safety of vessels on the Kill von Kull. It was pointed out that owing to unfavorable seasonal conditions and the brief time available for the investigation, certain questions of fact were not as completely substantiated as was desirable and that conclusions were consequently based to a considerable degree upon more general information.

The supplementary investigation carried out under the order of 1909 gave, therefore, not only additional time, but, owing to the earlier and more favorable time of the year for the investigation, a better opportunity for a more complete inspection of the operations of these plants and of observing the effects of these operations in creating a nuisance in Richmond county and on the Kill von Kull. The findings and results of this supplementary investigation constitute a full confirmation of the conclusions reached as a result of the former investigation, and a full report covering the same appears herewith.

REPORT OF AN INVESTIGATION OF AN ALLEGED NUISANCE EXISTING IN THE COUNTY OF RICHMOND (STATEN ISLAND) OCCASIONED BY MANUFACTURING OPERATIONS ON CONSTABLE HOOK, NEW JERSEY.

(Submitted by State Commissioner of Health Pursuant to an order of the Governor)

ORDER OF THE GOVERNOR

State of New York — Executive Chamber

To the State Commissioner of Health:

Whereas, a complaint was heretofore made by residents of the county of Richmond that within the State of New Jersey and city of Bayonne, at Constable Hook, in said State, there are maintained and operated certain extensive plants, furnaces, smelters, ovens and other appliances engaged in the manufacture of chemicals, the refining of oil, the roasting, reducing, smelting, manufacture and production of sulphur, copper, ores, and other products, and that such manufacturing plants are constantly generating and causing to be discharged over the territory comprising Richmond county vast quantities of noisome and disagreeable smoke, fumes, effluvia, noxious and poisonous vapors and gases which endanger or injure the comfort, repose, health and safety of a considerable number of persons, citizens of Richmond county,

And, whereas, heretofore, to-wit, on the 17th day of November in the year 1908, I required you to make an examination into the matters alleged in said complaint and into the questions affecting the security of life and health in the locality aforesaid in the county of Richmond, and to report the results thereof to me on or before the 21st day of December, 1908,

And, whereas, on the 17th day of December, 1908, you duly made your report to me of such examination and investigation,

And, whereas, after carefully considering said report and the matters therein contained and consulting with the Attorney-General of this State, it seems necessary, before taking further action, to have a supplemental report covering the matters hereafter more specifically set forth,

Now, therefore, I, Charles E. Hughes, Governor, require you to make a further examination into the matters alleged in said complaint, and particularly into the questions as to the share, if any, of responsibility for the conditions therein set forth of the Bergen Port Chemical Company, General Chemical Company, the Columbia Oil Company, and the Pacific Coast Borax Company, so-called, and any other companies, corporations or individuals in addition to those enumerated in your first report, and to make a supplemental report containing the results thereof to me on or before the 20th day of November, 1909.

Given under my hand and the Privy Seal of the State at the Capitol in the city of Albany this fourteenth day of October in the year of our Lord one thousand nine hundred and nine.

(SEAL)

CHARLES E. HUGHES

By the Governor:

ROBERT H. FULLER,
Secretary to the Governor

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ALBANY, N. Y., *November* 19, 1909.

HON. CHARLES E. HUGHES, *Governor of the State of New York,*
Albany, N. Y.:

SIR:— In accordance with your order issued October 14, 1909, requiring me to make a further examination into the matters alleged in the complaint of citizens resident in Richmond county heretofore made concerning certain extensive industrial plants located at Constable Hook in the city of Bayonne, N. J., and particularly into the question of the share, if any, of responsibility for the conditions therein set forth of the Bergenport Chemical Company, General Chemical Company, the Columbia Oil Company, and the Pacific Coast Borax Company, so-called, and any other companies, corporations or individuals in addition to those enumerated in my first report to you, dated December 17, 1908, and to make a supplemental report containing the results thereof to you on or before November 20, 1909, I have the honor to submit the following report:

In order that the nature and results of this further investigation and supplemental report on the matters with reference to the industrial plants referred to in your recent order may be more intelligently understood, and since this investigation must in a measure involve a continuation of extension of the work carried on during 1908, it will be well to refer to, and perhaps review briefly, the work and report of the former investigation, to the conclusions reached at that time and to certain essential points and factors that would or may have a bearing on the work and results of the present investigation.

It was pointed out in the conclusion to my report of December 17, 1908, that from the stacks and buildings of certain of the plants on Constable Hook, more especially the Standard Oil Company, the Orford Copper Company, the Bergenport Chemical Company and the General Chemical Company, smoke gases, fumes and vapors were emitted, intermittently or continuously, which under certain atmospheric conditions descend and pass over the county of Richmond and the Kill von Kull; that these smoke gases, fumes and vapors were generally of an objectionable, disagreeable and injurious nature, which at times affect the passage of light, offend the sense of smell, irritate the throat, interfering with breathing, and injure vegetation; and that by reason thereof these smokes, gases, fumes and vapors annoy, injure and endanger the comfort, repose, health and safety of a considerable number of persons in the county of Richmond, and constitute a public nuisance therein. These conclusions were, however, and as particularly pointed out in the report, based not alone upon field observations confined to the county of Richmond, where during the short period of about one month available for investigation the atmospheric conditions were not such as to cause the smoke, gases and fumes which did pass over Richmond county to descend and create a nuisance; but upon more general information gained during the investigation from a study of the plants and their operations, the nature of the gases, their periods of emissions, observations of their behavior under different atmospheric conditions, and their observed effects upon the sense; and also upon the evidence presented at a public hearing held in Richmond county when some thirty-three residents of the county and counsel for four of the plants located on Constable Hook were examined under oath, opportunity being given to counsel for the corporations to cross-examine witnesses, and the testimony of which established without contradiction the existence of the following matters of fact, to wit:

1. That noxious and disagreeable fumes, gases and smoke, so dense at times as to appear like a pall or fog, are discharged over the northern part of the county of Richmond, whenever the wind is in the north or points off thereof, and more particularly in damp weather.

2. That the smell of such fumes, gases and smoke was identified as having chemical or universal odors, or as having effects produced by sulphurous acid and chlorine.

3. That such fumes, gases and odors are increasing in volume.

4. That there are about 23,000 persons resident in the northern part of Richmond county where such fumes, gases and odors are mostly prevalent.

5. That such fumes, gases and odors have a noxious and nauseating odor which interferes with natural breathing and causes a choking and tickling sensation in the throat, producing

nausea and a feeling akin to suffocation. That they irritate the eyes and interfere with sleep and repose.

6. That in order to exclude these fumes, gases and odors, it is sometimes necessary to keep the doors and windows of a dwelling closed, even in summer time.

7. That tin and shingle roofs are seriously impaired.

8. That trees are denuded of their leaves and garden vegetation, grass and flowers are affected at times.

Although the evidence secured during my investigation of last year was from such sources and of such a nature as in my opinion to justify my conclusions stated at that time, it was clearly pointed out that from the nature of the problem then before me, and with the short time available for the investigation, it was impracticable to carry on field observations of a technical nature sufficient in all respects to justify what might be termed scientific conclusions. In fact, so important is this feature in relation to the present investigation since the time for which the report is returnable to you is again so limited, that I believe it will be well to discuss more fully than was done in my last report the difficulties presented in a problem of this nature, and what in my opinion should constitute the proper scope of an investigation of such a problem in order to reach conclusions based upon scientific and technical data. By so doing it will give a better idea as to the limitations which must necessarily be placed upon the scientific value of these two investigations made by me, and it will, incidentally, afford a suggestive outline for any future technical and scientific investigation which it may be found desirable or necessary to make.

One of the first difficulties met with and pointed out in my report to you of last year, and one which prevents in a large measure a determination of the relative responsibility which any one of these many plants on Constable Hook has in the creation of the nuisance in Richmond county, is the fact that all of these plants are located in close proximity to one another and that the fumes and gases emanating from them must travel for a considerable distance before reaching Richmond county. The result is that these gases and fumes become diffused and in large measure intermingle, thus making any differentiation difficult, if not impracticable.

Another difficulty, also pointed out, is that these smoke gases and fumes escape from the plants with a considerable degree of intermittency. While it is true that from one or two sources these smoke and fumes are emitted in a comparatively continuous and uniform manner and intensity, the majority of them are, however, emitted intermittently and with varying intensities, the result of which is to create a decided variation in the occurrence of any nuisance arising from them.

Still another difficulty arises in the nature of a variation in atmospheric condition. This variability in atmospheric condition plays a very important part not only with respect to the relative presence or absence of these gases and fumes in Richmond county, but also with respect to any scientific observations that may be made to determine their relative presence and effects. This is readily understood when we consider that these atmospheric conditions involve five important factors or variables, viz.: wind direction, wind velocity, barometric pressure, relative humidity and temperature; the wind direction, affecting the relative presence or absence of these smoke gases and fumes in Richmond county, and their relative mixing or interference with respect to a differentiation as to the particular sources from which they arise; the wind velocity, affecting the diffusion and dilution of the gases and the extent to which they are borne down to the ground, or are carried into the upper strata of air and above Richmond county; the barometric pressure, affecting likewise the tendency and extent to which these gases and fumes rise or fall with reference to the ground as a result of their specific gravity as compared with the air; the relative humidity (associated generally with barometric pressure) affecting the absorption of these gases by the moisture present, resulting possibly in a change in their chemical composition, and the extent to which they may be detected by or affect the senses; and the temperature, which in itself and independent of barometric pressure, probably has little effect upon the rise and fall of these gases and fumes, but in all probability does have some effect respecting intensity upon the senses.

Finally a difficulty is presented in the factor of distance from the plants. Manifestly, the nearer one is to the sources of these fumes and gases the more intense is the effect upon the senses, and conversely, the further away one is the less intense is this effect. To illustrate, the residents along the shore of Kill von Kull directly opposite these plants may be subject to a decided nuisance, while at the same time the residents miles back from these shores may be subject to a less nuisance or possibly none at all.

It must be evident, then, that with a large number of plants situated in close proximity to one another as on Constable Hook, emitting smoke, gases and fumes, intermittently and under all the variable conditions of atmosphere above referred to, a technical and scientific determination of all the facts and factors necessary to base accurate and scientific conclusions with respect to the nuisance created in Richmond county would demand an investigation involving not only an extensive series of observations, but one covering a considerable period of time. To be complete such an investigation should in my judgment include numerous observations made simultaneously at many selected points in Richmond county; chemical tests of samples of air, leaves, grass and soil from similarly selected points; volumetric and chemical determination of smoke, gases and fumes from the stacks and buildings of the plants on Constable Hook; and should cover a period sufficiently long to furnish comparative data under all the variable conditions above referred to. Judging from the observation of last year, when on only two days out of the seventeen days that field observations were carried on, was the wind in a quarter to appreciably affect Richmond county, and again this year when on only four days out of twenty-seven days of field observations was the wind in a similar quarter, it is evident that the time necessary for the collection of these complete, scientific and comparative data would probably have to extend over at least one entire season and probably over a number of seasons.

While all this is true with respect to technical and scientific determination of essential facts which should enter into an investigation of such a nature and while it is likewise true that such a complete and scientific investigation could not be carried out in the limited time available in your orders of last year and this year, it is in my opinion, as pointed out in my report to you last year, and again in this report, possible to secure through a less comprehensive investigation and perhaps by more approximate and less scientific means, and from the testimony presented at a public hearing before residents in Richmond county and representatives from the plants on Constable Hook, sufficient evidence to justify the findings and conclusions reached in my two reports of last year and this year.

Having thus outlined the difficulties and limitations necessarily involved in an investigation of this nature and magnitude, and with full appreciation of the brief time again available in which to investigate and report to you in accordance with your recent order, I will now present the results of my further examination into the matters alleged in the complaint heretofore made, and particularly into the question as to the share, if any, of the responsibility for the conditions therein set forth of the Bergenport Chemical Company, General Chemical Company, Columbia Oil Company and the Pacific Coast Borax Company, so called, and any other corporations, companies or individuals in addition to those enumerated in my first report of December 17, 1908.

Upon receipt of your order of October 14, 1909, an investigation was at once started to determine the facts and information requested by you. With the experience gained during my investigation of last year as to the nature and scope of information which it is practicable to secure in the interval available, and, keeping in mind the desirability of securing, if possible, more scientific information concerning the matters alleged, the following plan and methods of investigation were decided upon:

(1) Engineering field observations in Richmond county comprising a log of daily observations showing:

a Atmospheric conditions, such as wind velocity, wind direction, barometric pressure, relative humidity and temperature.

b Times and periods of emissions of smoke gases, fumes and vapors from the various stacks and buildings of the plants on Constable Hook.

c Observed effect upon the senses and upon health at times or during periods when atmospheric conditions were such as to cause the smoke gases and fumes to cross the Kill von Kull into Richmond county.

(2) Collection and analysis of samples of air and leaves from Richmond county, comprising:

a The collection of samples of air at certain points in Richmond county and at times selected with reference to securing analytical evidence of presence of smoke gases and fumes and with reference to determining the extent to which the different plants are responsible for the conditions of a nuisance in Richmond county.

b The collection of samples of leaves from selected points in Richmond county to determine the presence of chemicals associated with operations carried on in the plants on Constable Hook.

c Laboratory work of determination of chemical constituents in the samples of air and leaves collected in Richmond county, referred to above, and a study of these results with respect to any evidence they may furnish in corroborating other evidence secured by physical observations, and as to the share of responsibility which the various plants on Constable Hook might have in the nuisance created in Richmond county.

(3) Reinspections of the various plants on Constable Hook, especially of the four plants of the Bergenport Chemical Company, General Chemical Company, the Columbia Oil Company and Pacific Coast Borax Company, for the securing of more full and positive information as to the operations in these plants with respect to the part which each may play in the cause of the nuisance in Richmond county, and for determining what changes or improvements have been made or are in progress toward the mitigation of this nuisance.

(4) Transcript, tabulation and study of the records of the U. S. Weather Bureau for this locality (bringing the record of last year up to date), showing days and seasons when wind direction and other atmospheric conditions were such as would probably create a nuisance in Richmond county.

The methods or procedure followed in carrying on these observations and in securing the information and the data referred to, and the results or evidence deduced from them will now be given more in detail and under each of the above headings, as follows:

Engineering Field Observations

These observations, as stated in my report of December 17, 1908, were for the purpose of determining the extent which the various smoke gases and fumes were emitted from the various plants on Constable Hook, the proportional time when the atmospheric conditions were such as to bring them across the Kill von Kull into Richmond county and the extent to which they affected the senses or otherwise were the cause of a nuisance or injury to persons and property in Richmond county. The log of these daily observations for the period from October 19 to November 17, 1909, inclusive, are presented in Appendix I, which is arranged in tabular form showing:

1. The times and duration during the day that smoke, gases and fumes were emitted from the various stacks and buildings of the plants which were under special observation.
2. The general direction and velocity of the wind on these days and their effect in disseminating and carrying these smokes, gases and fumes through the atmosphere and over the Kill von Kull and Richmond county.
3. The barometric pressure and relative humidity of the air on these days and the effect of them in disseminating and conveying these fumes and gases through the atmosphere and over the Kill von Kull and Richmond county.
4. The absolute effect of the emissions of these smoke fumes and gases at times when the wind was in a direction to carry them over the Kill von Kull and Richmond county, in producing objectionable conditions in Richmond county and the Kill von Kull; and the relative intensity of these objectionable conditions under varying meteorological conditions and at various distances back from the shore.

It will be seen from these observations that the smoke, gases and fumes emitted from the plants during this period, which with reference to the season of the year, is about one month earlier than the period of last year, were, generally speaking, of similar character, intensity and frequency. Further, the atmospheric conditions were, in general, not essentially different with respect to the frequency and duration when the gases and fumes would cross the Kill von Kull and affect Richmond county than they were last year.

A very noticeable difference in conditions was, however, observed this year as compared with last year, in that on four of the days when the wind was from a northerly direction, viz., October 24 and 25, and November 9 and 10, 1909, the atmospheric conditions were such as to bring the smoke, gases and fumes across and down upon Richmond county in such manner and volume as to enable me to state positively that at these times the smoke, gases and fumes were distinctly observable to the senses, that they were offensive, of an irritating nature, interfering with breathing, and that they passed over the Kill von Kull in dense clouds of black smoke and colored vapors or fumes interfering with the passage of light; and that as a result of these conditions a public nuisance was created in Richmond county and on the Kill von Kull.

Furthermore, it was possible to observe, by the direction of the wind with reference to the observer and the location of the different plants on Constable Hook, and through the sense of sight and smell, that the smoke, fumes and gases responsible for the nuisance above referred to emanated principally from the stacks and buildings of the Bergenport Chemical Company, the Standard Oil Company and the Orford Copper and Sulphur Company. It was not possible by these means to differentiate further with respect to the share which the other plants might have in the nuisance created at these times.

Collection and Analysis of Samples of Air and Leaves from Richmond County

Attention has already been called to the desirability, though difficulty, of securing technical and scientific evidence of the presence or effect in Richmond county of smoke, gases and fumes emitted from the plants on Constable Hook, as well as the impracticability of carrying on a full and comprehensive study along these lines in the short time available for these investigations and with the limited force and facilities of this Department. It was thought, however, that some evidence of this nature such as could be furnished by chemical tests, even though incomplete, might prove helpful in substantiating or corroborating the results secured by physical observations, and it was accordingly planned to carry out a limited series of chemical analyses of the air, and of leaves in Richmond county, the general procedure for which and the results accomplished will now be given.

(a) *Samples of Air*

With respect to the collection of samples of air for analyses it was important to select times when the wind direction and atmospheric conditions were such as would bring the smoke, gases and fumes from the plants on Constable Hook across to and upon Richmond county. It was also important in order to differentiate, if possible, as to the responsibility which the different plants played in the cause of conditions in Richmond county, to select such points for observations with reference to wind direction and other atmospheric conditions as would make this differentiation possible. Advantage was, therefore, taken of the periods when the atmospheric conditions were suitable for the collection of samples with reference to the above requirements, and at these times, which occurred only on the days of November 9, 10 and 13, these samples were collected.

Without describing in detail the apparatus employed and the methods of collection, it may be said that a specific volume of air was in each case passed through a filter of broken glass kept wet with chemical solutions of a nature which would absorb and permit of the determination of certain gases, fumes and vapors as would be expected from the operations known to be carried on in these plants.

The first of these samples was collected on the morning of November 9 when the atmospheric conditions were such as to carry the gases and fumes from the Bergenport Chemical Company across to Richmond county, and the sample was collected directly in the path of the gases and fumes from this plant, the points selected being the platform of the Livingston railroad station and from the platform of a building on the south shore of the Kill von Kull about 300 feet west of said station.

In the collection of this sample about 1,125 cubic feet of air was passed through the apparatus. Since the wind direction and other atmospheric conditions were such as to carry the fumes from the Bergenport Chemical Company to the points of observation by a line which would not appreciably permit of mixing the gases and fumes from other plants on Constable Hook, any results from this sample may be considered as coming largely or wholly from the Bergenport Chemical Company.

The second of these samples was collected on the afternoon of November 9 under conditions analogous to those described above for the Bergenport Chemical Company, but when the direction of the wind and other atmospheric conditions were such as to carry the smoke, gases and fumes which were emitted from the principal stacks and buildings of the Standard Oil Company and the Tide Water Oil Company across to Richmond county. This sample was collected from the end of a pier of the Staten Island shipyard, about 300 feet east of the Bergen Point ferry slip. This point was comparatively at a considerably greater distance from the sources of these gases than in the case of the sample taken in connection with the Bergenport Chemical Company. During the collection of this sample the wind unfortunately shifted in direction so that it was necessary to stop the collection of this sample before the desired amount of air had been passed through our apparatus, the amount collected being only about 150 cubic feet as compared with the much greater amounts collected in the other cases. The direction of the wind, atmospheric conditions and position of the sampling point were such, however, that any results obtained from this sample may be considered as coming largely, if not wholly, from the Standard Oil Company and the Tide Water Oil Company.

The third of these samples was collected on the morning of November 10, when the atmospheric conditions were such as to carry the smoke, fumes and gases from the buildings of the Orford Copper and Sulphur Company across to Richmond county, the sample being collected from the platform of the Snug Harbor railroad station. The conditions under which this sample was collected were more favorable than in the two former cases, and the amount of air passed through our apparatus was approximately 900 cubic feet. The atmospheric conditions during the collection of this sample were such that any results obtained may be considered as coming wholly from the Orford Copper and Sulphur Company.

The fourth and last of these series of samples was collected on the morning of November 13th, when the atmospheric conditions were such as to carry the gases and fumes from the plant of the Bergenport Chemical Company across to Richmond county, the sample being collected from points along the shore in front of the Sailors' Snug Harbor so situated as to keep the apparatus in line with the gases and fumes from the Bergenport Chemical Company. The atmospheric and other conditions under which the sample was collected were more favorable to securing representative results than were the conditions under which sample No. 1 was taken, which also was representative of the Bergenport Chemical Company. It was further possible with this sample to pass a considerably greater volume of air, about 1,650 cubic feet, through the apparatus.

The results of the chemical analyses of these samples of air are as follows:

Sample No. 1 *(representing Bergenport Chemical Company)*

Volume of air collected	1,125 cubic feet
Sulphur trioxide present	0.046 grams
Sulphur trioxide per 1,000 cubic feet	0.041 grams
Arsenic	0.000

Sample No. 2 *(representing Standard Oil Company and the Tide Water Oil Company)*

Volume of air collected	150 cubic feet
Sulphur trioxide present	0.092 grams
Sulphur trioxide per 1,000 cubic feet	0.612 grams
Arsenic	0.000

Sample No. 3 *(representing Orford Copper and Sulphur Company)*

Volume of air collected	900 cubic feet
Sulphur trioxide present	0.185 grams
Sulphur trioxide per 1,000 cubic feet	0.205 grams
Arsenic	0.000

Sample No. 4 (representing the Bergenport Chemical Company)

Volume of air collected	1,650 cubic feet
Sulphur trioxide present	0.156 grams
Sulphur trioxide per 1,000 cubic feet	0.095 grams
Arsenic	0.000

It will be seen from the results of these analyses that sulphur trioxide was found in all of the samples collected, the largest amount, indicated by the sulphur trioxide per 1,000 cubic feet of air, being found in Sample No. 2 representing the Standard Oil Company, and the Tide Water Oil Company, and the least amount being found in Sample No. 1, the lesser determination representing the Bergenport Chemical Company.

Since these samples were collected under widely different conditions as to atmosphere, wind direction, wind velocity and other factors, the relative amounts of sulphur trioxide found in each instance can not be considered as a criterion for judging the relative responsibility of these plants in the creation of the nuisance in Richmond county and Kill von Kull. This is well illustrated by a comparison of the two samples, No. 1 and No. 4, representing the Bergenport Chemical Company, wherein sample No. 1, taken at a time when the wind velocity was some four times as great as when sample No. 4 was collected and therefore the gases and fumes were relatively greatly diluted, shows about twice the amount of sulphur trioxide per 1,000 feet as shown by sample No. 4. The most that can be said with reference to these results is that they prove conclusively that sulphur gases or fumes were present in the air at the respective points in Richmond county and at the times when the samples were collected, and that this evidence corroborates the evidence obtained through other means of observations and other sources of information.

It will be noted that no arsenic was found in any of these samples of air. This may be due to its entire absence in the samples collected, or to the fact that its presence was in such minute quantities as not to be detected by the chemical tests used.

(b) *Samples of Leaves*

Owing to the negative results obtained from samples of air with respect to presence of arsenic, due possibly to minute amounts present in the volumes of the samples collected, but considering the possibility of their cumulative action resulting in their possible presence in vegetation exposed to the action of such fumes, and gases as are emitted from the plants in Constable Hook, it was decided to collect samples of leaves and examine them chemically for traces of arsenic.

Although the season of the year was not the most favorable for chemical determinations of this nature, since the leaves on the northerly side of trees fronting on the Kill von Kull, and therefore most likely to be affected by the fumes and gases from the plants on Constable Hook, had mostly fallen from the trees, samples were, nevertheless, collected from trees upon the grounds of the Sailors' Snug Harbor at the following points:

Samples 1a and 1b were collected from elm trees 150 feet south of the Kill von Kull and located westerly from the main entrance to Sailors' Snug Harbor 25 and 170 feet respectively. The leaves were collected from points on the trees fifteen and eighteen feet respectively from the ground. Both samples were collected from the south side of the trees, since the leaves on the north side of the trees had fallen, but the branches from which the collections were made were so situated as to leave little or no obstruction to the smoke and fumes from Constable Hook which might pass these points.

Samples 2a and 2b were taken from soft maple trees about one-third mile southerly from the water-front and located 220 and 170 feet respectively north of Henderson avenue and just east of main road through the harbor grounds. These samples were collected from different parts of the trees about seventeen feet above the ground.

Samples 3a and 3b were taken from catalpa trees and shrubs about three-fourths miles south of the water-front and located just south of Castleton avenue and 100 feet easterly and 200 feet westerly respectively from the Castleton avenue entrance to the Sailors' Snug Harbor. These samples were collected from different parts of the trees about fifteen feet and five feet respectively above the ground.

The samples were all collected in paper bags and sent to the State Hygienic Laboratory for analysis. In order that the analyses might be representative of the comparative presence of the arsenic sought for, a selected number of leaves to make a composite sample of the same quality were used in each chemical determination. Unfortunately, owing to the lack of time and facilities, it was not possible to work out quantitative results, but it was possible to work out comparative results based on relative intensities of the " arsenic mirror." The procedure was to test a definite quantity of selected leaves from each sample by the " arsenic mirror " method, basing the comparison between the limits of the least and highest amounts shown by the " mirrors." Thus, the test which showed, by intensity of appearance of the " mirror," the highest amount of arsenic, was given a relative number 1, while the sample showing the least amount of arsenic was given a relative number 5. By then assuming an arbitrary scale between these limits of 1 and 5, the other samples could be easily compared.

The results of these determinations are given in the following table, representing in the different columns the essential data for each sample.

Table showing relative amounts of metallic arsenic according to assumed " arsenic mirror " scale, found in leaves collected from trees and shrubs on the grounds of Sailors' Snug Harbor

Sample number	Location of sampling point	Distance above ground sample was collected	Character of leaves	Relative amounts of metallic arsenic according to assumed " arsenic mirror " scale
1a.	150 ft. from Kill von Kull and 25 ft. west of main entrance to Sailors' Snug Harbor	15	Elm	1
1b.	150 ft. from Kill von Kull and 170 ft. west of entrance to Sailors' Snug Harbor	18	Elm	1
2a.	Just east of main road through harbor grounds and 220 ft. north of Henderson avenue	17	Maple	4
2b.	Just east of main road through harbor grounds and 170 ft. north of Henderson avenue	17	Maple	2
3a.	Just south of Castleton avenue and 100 ft. east of entrance to Sailors' Snug Harbor	15	Catalpa	5
3b.	Just south of Castleton avenue and 200 ft. west of entrance to Sailors' Snug Harbor	5	Catalpa	3

It will be seen from the results of these analyses that arsenic was found in one or both of the samples collected from each of the three principal stations selected on the grounds of Sailors' Snug Harbor, viz., about 150 feet, one-third mile and three-fourths mile respectively back from the Kill von Kull. It will further be seen from the columns in this table showing relative amounts of arsenic found at these stations, using averages of the two samples collected at each, that the relative amounts of arsenic present are proportional to the distances from the plants on Constable Hook.

Although no statement can be made as to the absolute quantitative amounts of arsenic present in any specific quantities of leaves, it can be stated positively, from these results, that arsenic was present in the vegetation and in relative quantities which are proportional to the distances from the plants on Constable Hook. Further than this, it may be stated from a knowledge of the operations carried on in the plants on Constable Hook, the nature and amounts of raw materials used in them, that the sources of the arsenic found were from the plants of the Orford Copper and Sulphur Company, the Bergenport Chemical Company and the General Chemical Company.

As to the significance of the presence of this poisonous metal in the samples of leaves collected in Richmond county in relation to injury to health and vegetation, it may be said that while no opportunity was had to determine anything but comparative amounts of this poisonous metal in the leaves, I am of the opinion, judging from the relative small quantities of leaves which were used in the tests and the rather marked indications of the "arsenic mirror" observed generally with the samples, that the amount of arsenic in the gases and fumes emitted from the plants on Constable Hook is sufficient to not only injure vegetation, but to affect, if not injure, the health of persons in Richmond county.

Reinspection of Plants on Constable Hook

During my investigation of last year a careful inspection was made of the different plants located on Constable Hook and in my report to you of December 17, 1908, the general character and location of these plants and the operations carried on within them were carefully described. These plants were again inspected during the present investigation for the purpose of securing additional information with respect to their operations, or as to any additions or changes that may have been made in construction or operation which might add or lessen the extent of the nuisance created in Richmond county, or as might affect in any way the share, if any, of the responsibility of the various plants for the nuisance created in Richmond county, more especially the plants of the Bergenport Chemical Company, General Chemical Company, Columbia Oil Company and the Pacific Coast Borax Company, so-called, or any other company or individuals in addition to those enumerated in my former report.

Since these plants were all carefully described in my previous report to you of December 17, 1908, descriptions of them will not be repeated in detail but only with respect to additional information secured or to any changes and modifications made in construction and operation of the plants and to the extent to which this additional information or changes in construction or operation may affect generally the nuisance created in Richmond county or the share of responsibility which the respective plants might have therein. The different plants will now be taken up and the results of my further examination of them will be given individually and in order, as follows:

(1) *Standard Oil Company*

The plant of the Standard Oil Company and the operations carried on within it were carefully inspected last year and in my report to you of December 17, 1908, the method of treating the crude oils and the processes of converting them into marketable products was fully described. A detailed and thorough reinspection of the plant was made this year, which showed that no essential changes have been made in the general processes of purifying and refining the crude oils, but which did show that certain improvements have been completed and others are under way, as follows:

1. A water scrubber has been installed at the copper oxide revivifying plant for the purpose of decreasing the amount of sulphurous fumes discharged from this plant.

Further, in this plant steam has been introduced to the straightway furnaces for the purpose of decreasing the amount of black smoke resulting from the burning of the oil in the copper oxide compound.

2. A scrubber has also been installed at the exit of the clay revivifying plant which tends to precipitate the unconsumed oil given off in the process of burning the oil out of the clay.

3. Two of three contemplated smoke consumers have been installed at the power plant in order to reduce the dense black smoke resulting from the burning of the heavy unsalable oil or acid tar.

4. Four of the eighty crude oil stills which leave a residue of tar, from which results a wet coke after further treatment, have been converted into tower stills which reduce the crude oils directly to dry coke. These four stills have not yet been put into operation, but it was stated that they would be connected and put into operation soon after the time of the inspection. Twelve similar tower stills have been constructed and are about to be erected.

It was stated that it is proposed to install towers on thirty-six of the remaining crude oil stills. It is expected that when this installation is complete the tar agitators in the paraffine department will be done away with and the residual impurities in the crude stills will be reduced to dry coke.

Although the above improvements and additional equipments have somewhat reduced the volume of fumes, gases and smoke discharged at the Standard Oil plant, the total reduction in the smoke, gases and fumes from these sources is only slight, in view of the many points from which smoke, gases and fumes are still discharged into the atmosphere.

The stacks and buildings from which smoke, gases and fumes are still discharged into the atmosphere are as follows:

1. From the copper oxide revivifying plant exits.
2. From the tar agitators in the paraffine department.

3. From the stills under which is burned wet coke rich in sulphuric acid.

4. From the acid restorers in the paraffine department where acid sludge resulting from the purification of lubricating oil is cooked with steam to restore the acid.

5. From the stills in the paraffine department under which is burned acid sludge produced at the acid restorers.

6. From the agitators in which light illuminating oils are purified.

7. From the acid separators.

8. From the power plant where the unsalable oil or acid tar produced at the acid separators are burned.

In view of the magnitude of the operation of this plant and the numerous sources from which smoke, gases and fumes are emitted therefrom, it is evident that this plant, notwithstanding the few improvements that have been made, is responsible in a large measure for the nuisance created in Richmond county.

(2) *Columbia Oil Company*

As stated in the report of last year, and as again observed this year, no objectionable smoke or fumes were observed to come from the plant of the Columbia Oil Company. The company refines from 10,000 to 30,000 barrels of oil per month and sometimes as many as 50,000 barrels per month in the production of light illuminating oils. Pennsylvania crude oils containing comparatively little sulphur are refined and no paraffines, lubricating or other heavy oils are produced. Since only " sweet " oils are treated, copper oxide is not used in purifying the oils.

The thin coke residue from the stills is disposed of by mixing it with anthracite culm which is used as fuel under the stills and boilers, and so far as could be observed, no appreciable smoke gases or fumes are emitted from this plant.

(3) *The Tide Water Oil Company*

The operations at this plant, as stated in the former report, consist of the refining of crude oil amounting to about 10,000 barrels per day.

Although on account of the character of the oil refined, copper oxide is not used, as is the case with some of the oils refined by the Standard Oil Company, large quantities of sulphuric acid are nevertheless used in purifying the oils, and in the production of paraffine. A certain amount of this sulphuric acid is discharged into the atmosphere from the agitators in the form of sulphurous gases and, in addition, a similar loss occurs in the burning of sludge cake which contains more or less acid.

A large quantity of spent acid is recovered for further use. This recovery is followed by a process of restoration and concentration which also gives rise to sulphurous fumes.

No material change in the conditions of operation at this plant have been made during the year so that the effect of the smoke, fumes and gases arising from this plant, as contributing to the nuisance in Richmond county, has not been changed during the year.

The general character and effect of the smoke, gases and fumes emitted from this plant are similar to those arising from certain operations of the Standard Oil Company, but since the amount of oil refined is considerably less and the crude oil contains in general less sulphur the smoke, gases and fumes given off by this plant have relatively much less effect in the causation of the nuisance in Richmond county than do the smoke, gases and fumes from the Standard Oil Company's plant.

(4) *Orford Copper and Sulphur Co.*

Although no detailed examination was made of this plant during this investigation, so far as could be learned from our observations no material changes have been made in the construction and operations of this plant since my report to you of December 17, 1908, and therefore the emission of smoke, gases and fumes from this plant as affecting Richmond county are substantially the same as they were a year ago.

As was noticed during the investigation of last year, considerable quantities of vapors, fumes and smoke issue from the ventilators of the main buildings. It was also learned at that time that improvements were under way which it was thought would eliminate to a large extent this discharge of vapor and fumes from the main buildings, but it is evident from the large volumes of vapors, fumes and smoke still being discharged from the ventilators of these buildings that little or no decrease in the emission of smoke, fumes and vapors has resulted from any such improvements.

(5) *Fenaille and Despeaux*

No operations are carried on upon the property of this company and conseqently this company does not enter in any way into the nuisances created in Richmond county.

(6) *F. W. Devoe & C. T. Raynolds*

Upon the property of this company, likewise, no operations are carried on and consequently this company is not responsible in any way for the nuisance created in Richmond county.

(7) *Bergenport Chemical Company*

A full description of this plant and the operations carried on within it, and of the various sources of fumes, gases and vapors arising from this plant, was included in the report of December 17, 1908. This plant was again carefully inspected during the present investigation, and it was found that no essential changes in the equipment or methods of operation at the plant have been made during the year.

From this further examination, and from the observations made during this investigation, it was found that the volume and character of the smoke gases and fumes emitted from this plant, and the extent to which they affect, and share in, this nuisance created in Richmond county are substantially the same as they were a year ago.

(8) *The Bergenport Sulphur Works*

A reinspection of this plant during the present investigation showed that as stated in last year's report, no objectionable odors or fumes were discharged from it which could be said to affect in any appreciable extent Richmond county. The processes carried on at this plant consist of the purifying of crude sulphur and the manufacture of flowers of sulphur. In the sublimation of the sulphur, and in the grinding and sifting operations some sulphur dust is given off, but it is observed that this dust is not conveyed by the the winds to any considerable distance from the plant.

(9) *The Pacific Coast Borax Company*

The operations of the plant of the Pacific Coast Borax Company were carefully investigated last year and are fully described in my former report. A thorough reinspection of this plant was made this year which showed that no material changes have been made in the operation, production or output which would affect appreciably the volume and character of vapors discharged from this plant. On several occasions careful inspections were made of the exits on this plant from which steam and vapors are given off, but it was always found, as stated in my former report, that such steam and vapors were not of a disagreeable or objectionable nature and could not be detected at any considerable distance from the plant.

(10) *General Chemical Company*

The operations of this plant were carefully inspected during the investigation of last year and were fully described in my report of December 17, 1908. A thorough reinspection of this plant was made this year. The only change that was observed at this plant was the erection of a briquetting plant in which the slag or refuse from the ore burners of the sulphuric acid plant is mixed with water, moulded into briquettes, and vitrified under a high temperature in a furnace fired with producer gas.

This further examination indicates that additional sulphurous fumes are probably discharged into the atmosphere from this plant as a result of the briquetting of this slag which is subjected to very high temperatures, and as a result any residual sulphur in the slag or refuse from the ore burners would be converted into sulphurous fumes and emitted from the newly constructed high stack of this plant.

While it was not possible at the times of inspections to observe the character of the smoke and fumes from the chimney of the briquetting plant owing to the height of the chimney and the mixing of these gases and fumes with others on Constable Hook, it was observed that the smoke and fumes discharged from the stack were carried by the air currents to considerable distances, which would indicate the presence of gases or fumes other than those due merely to coal or gas combustion. It is, therefore, probable that the installation and operation of this briquetting plant during the past year has resulted in an increase in the share which the plant of the General Chemical Company is responsible for the nuisance created in Richmond county.

Records of U. S. Weather Bureau

The important influence which the direction of wind and other atmospheric conditions have upon the transmission of the smoke gases and fumes from the plants on Constable Hook across and over the Kill von Kull and Richmond county was pointed out and discussed in my former report to you of December 17, 1908, when estimates were presented, based primarily upon the records of the U. S. Weather Bureau, showing approximately the extent, or proportion, of time during which these smoke gases and fumes annoy or injure persons and property in Richmond county and on the Kill von Kull. In order that the information presented last year, based upon records covering the period from November 1, 1906, to December 11, 1908, might be supplemented by the inclusion of additional records, thus affording more complete and reliable estimates, the records of the Weather Bureau office in New York were again consulted and tables prepared last year and based upon these were brought up to date, i. e., to November 16, 1909, the last day available for transcribing them.

Appendix II presents in tabular form these records of weather conditions for the period from December 12, 1908, to November 16, 1909, inclusive, which taken in conjunction with the records previously reported, covers a period of 1,111 days, or about three years. The table in Appendix II is presented in the same form as the table in my previous report of December 17, 1908, and a preliminary statement in Appendix II describes the various statistics included under each column, and the abbreviations used.

A summary will now be presented covering the records of the entire period from November 1, 1906, to November 16, 1909, which includes the records previously submitted in Appendix III of my report of December 17, 1908, and the records herewith submitted in the accompanying Appendix II, showing the total and proportional number of days when the prevailing wind was in a northerly direction; the total and proportional number of days in addition to the above when the wind was north or northeast for a portion of the day between one and twelve hours, but when the *prevailing wind* for the day was from other directions; and the total and proportional number of the above days when the conditions of barometric pressure and relative humidity were such as to probably cause the smoke gases and fumes to descend over a part of Richmond county or the Kill von Kull, as follows:

1. On 475 days, representing 42.8 per cent. of 1,111 days for which records were secured, the prevailing wind was from a northerly direction.
2. On 247 days, in addition to the above, representing 22 per per cent. of the total number of 1,111 days, the wind was from the north or northeast for a period during the day between one and twelve hours when the *prevailing wind* for the day was from other directions.
3. Of the 722 days included above under (1) and (2) it is estimated that about 200 days, representing about 18 per cent. of the total number of 1,111 days for which records were secured, the conditions of barometric pressure and relative humidity were such as to probably have caused smoke gases and fumes from plants on Constable Hook to descend over a part of Richmond county or the Kill von Kull.

Public Hearing

The question of holding a public hearing in Richmond county during the present investigation was carefully considered, but in view of the supplementary nature of this investigation, of the opportunity previously afforded the residents of Richmond county and representatives of the various plants located on Constable Hook of testifying at the public hearing held at the Borough Hall, New Brighton, Richmond county, on December 7 and 8, 1908, and of the full and undisputed testimony brought out at that hearing, it was thought that nothing of essential importance could be gained by the holding of another public hearing, and for these reasons no such hearing was held.

Summary and Conclusions

It will be seen that one of the important features of the present investigation as compared with my previous investigation of last year, was the better opportunity afforded by more favorable atmospheric conditions for determining through physical observations and by corroborative evidence of a chemical nature the extent of the nuisance created in Richmond county by the smoke gases, fumes and vapors emitted from the plants on Constable Hook. This better opportunity and the additional evidence gained enables me to state with more positiveness the character and extent of the nuisance created, and, with due consideration to certain slight modifications later referred to, enables me to corroborate generally the conclusions reached through my former investigation and stated in the report to you of December 17, 1908, which, as pointed out above, were based on evidence sufficient for their justification, but which were of a more general and approximate, and perhaps less technical and scientific, nature.

Owing to the supplementary nature of the present investigation, and to the close relationship which any conclusions based thereon must naturally bear to the findings and conclusions deduced from my former investigation and in order to make the conclusions herewith given more comprehensive and complete, I will include as a basis for them the results and reports of both investigations.

In view of all the foregoing, then, I hereby find and certify:

1. That on Constable Hook in the city of Bayonne in the State of New Jersey, there are located and maintained a number of corporations and industrial plants, some of which are engaged in the refining of oil, the manufacture of chemicals, the smelting and refining of ores and other operations of a similar or allied nature.

2. That from the stacks and buildings of certain of these plants smoke gases, fumes and vapors are emitted either continuously or intermittently, which, under certain atmospheric conditions, descend and pass over Richmond county and the Kill von Kull.

3. That these smoke gases, fumes and vapors are emitted in large quantities and contain, in addition to the smoke of combus-

tion of coal, coke and oils, certain fumes and gases containing compounds of sulphur, nitrogen and arsenic.

4. That these smoke gases, fumes and vapors are generally of an objectionable, disagreeable and injurious nature which affect the free passage of light, offend the senses of sight and smell, irritate the throat and interfere with breathing, and poison and injure vegetation.

5. That according to the statistics secured from the United States Weather Bureau for this district covering a period of about three years, it is estimated that there were about 200 days, representing about 18 per cent. of the number of days included in this period, in which the direction of the wind and other atmospheric conditions were such as to cause the smoke gases, fumes and vapors to descend and pass over and upon the Kill von Kull.

6. That when these smoke gases, fumes and vapors descend and pass over and upon Richmond county and the Kill von Kull, a public nuisance is created in said county of Richmond and upon the Kill von Kull by reason of the offensive, irritating, poisonous and otherwise objectionable and injurious nature of said smoke gases, fumes and vapors.

7. That the plants largely, if not wholly, responsible for the conditions above referred to and the resultant nuisance are the Bergenport Chemical Company, the General Chemical Company, the Standard Oil Company, the Tide Water Oil Company and the Orford Copper and Sulphur Company.

8. Of these five plants thus responsible for these conditions, the plants of the Bergenport Chemical Company, the Standard Oil Company and the Orford Copper and Sulphur Company are, in my opinion, owing to the character of the products manufactured, the magnitude of the operations carried on within the plants and the relative distances of these plants with reference to Richmond county, more largely responsible for the nuisance in Richmond county and on the Kill von Kull than are the plants of the General Chemical Company and the Tide Water Oil Company.

9. That within the limited time available for making the investigations of last year and of this year, and without a more comprehensive and complete investigation carried on over at least one season, and possibly a number of seasons, it is impracticable

to differentiate at this time with any degree of accuracy, or even approximately, the real share of responsibility which these five plants have in the nuisance created in Richmond county and on the Kill von Kull.

10. That the plants of the Columbia Oil Company, the Pacific Coast Borax Company, the Bergenport Sulphur Company and the corporations of Fenaille & Despeaux, F. W. Devoe and C. T. Raynolds are not to any appreciable extent responsible for the conditions above referred to and the resultant nuisance.

11. That subsequent to my investigation of a year ago certain changes have been made in the construction and operation of the plants of the General Chemical Company and the Standard Oil Company, which in the case of the Standard Oil Company has somewhat lessened the share which that company was responsible for the conditions above referred to, but which in the case of the General Chemical Company has somewhat increased the share which that company was responsible for said conditions.

12. That no other corporations or individuals on Constable Hook in addition to these enumerated in my last report, were found to share in the responsibility for the nuisance created in Richmond county and on the Kill von Kull.

In view of the results of the two investigations made by me in 1908 and 1909 respectively, and the findings and conclusions based thereon as above set forth, and notwithstanding the changes in construction and operation in certain plants on Constable Hook made during the period intervening between these two investigations, I hereby again find and certify that the conditions existing in the county of Richmond and on the Kill von Kull constitute a public nuisance for the reason that smoke gases, fumes and vapors are emitted from certain plants located on Constable Hook in the city of Bayonne in the State of New Jersey; and that said smoke gases, fumes and vapors annoy, injure and endanger the comfort, repose, health and safety of a considerable number of persons and render a considerable number of persons insecure in the use of property.

Respectfully submitted,

EUGENE H. PORTER,
Commissioner of Health

APPENDIX I

TABLE SHOWING OCCURRENCE OF SMOKE AND FUME DISCHARGE ON CONSTABLE HOOK FROM WORKS OF STANDARD OIL COMPANY

Date 1909.	"Revivifying" Plant.	Clay Recovering Plant.
Oct. 19.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
20.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
21.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
22.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
23.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
24.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
25.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
26.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
27.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
28.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
29.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
30.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
31.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
Nov. 1.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
3.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
4.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
5.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
6.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
9.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
10.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
11.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
12.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
13.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
14.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
15.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
16.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.
17.	Constant bluish white smoke and fumes	Bluish white smoke and vapors.

APPENDIX I — *Continued*

Date 1909.	Oil Stills.	Power Plant.
Oct. 19.	Intermittent dense black smoke	Occasional dense black smoke.
20.	Intermittent dense black smoke	Occasional dense black smoke.
21.	Intermittent dense black smoke	Occasional dense black smoke.
22.	Intermittent dense black smoke	Occasional dense black smoke.
23.	Intermittent dense black smoke	Occasional dense black smoke.
24.	Intermittent dense black smoke	Occasional dense black smoke.
25.	Intermittent dense black smoke	Occasional dense black smoke.
26.	Intermittent dense black smoke	Occasional dense black smoke.
27.	Intermittent dense black smoke	Occasional dense black smoke.
28.	Intermittent dense black smoke	Occasional dense black smoke.
29.	Intermittent dense black smoke	Occasional dense black smoke.
30.	Intermittent dense black smoke	Occasional dense black smoke.
31.	Intermittent dense black smoke	Occasional dense black smoke.
Nov. 1.	Intermittent dense black smoke	Occasional dense black smoke.
3.	Intermittent dense black smoke	Occasional dense black smoke.
4.	Intermittent dense black smoke	Occasional dense black smoke.
5.	Intermittent dense black smoke	Occasional dense black smoke.
6.	Intermittent dense black smoke	Occasional dense black smoke.
9.	Intermittent dense black smoke	Occasional dense black smoke.
10.	Intermittent dense black smoke	Occasional dense black smoke.
11.	Intermittent dense black smoke	Occasional dense black smoke.
12.	Intermittent dense black smoke	Occasional dense black smoke.
13.	Intermittent dense black smoke	Occasional dense black smoke.
14.	Intermittent dense black smoke	Occasional dense black smoke.
15.	Intermittent dense black smoke	Occasional dense black smoke.
16.	Intermittent dense black smoke	Occasional dense black smoke.
17.	Intermittent dense black smoke	Occasional dense black smoke.

APPENDIX I — *Continued*

TABLE SHOWING OCCURRENCE OF SMOKE AND FUME DISCHARGE ON CONSTABLE HOOK FROM WORKS OF ORFORD COPPER AND SULPHUR COMPANY

Date 1909.	High chimney at smelting plant.	Ventilators on smelting plant.	Boiler plant.	Evaporating plant.
Oct. 19.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
20.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
21.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
22.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
23.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
24.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
25.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
26.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
27.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
28.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
29.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
30.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
31.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
Nov. 1.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
3.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
4.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
5.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
6.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
9.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
10.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
11.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
12.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
13.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
14.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
15.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
16.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.
17.	Continuous dense white smoke and fumes..	Intermittent bluish white vapors and fumes..	Dense black smoke..	Bluish white vapors.

APPENDIX I — *Continued*

TABLE SHOWING OCCURRENCES OF SMOKE AND FUME DISCHARGE ON CONSTABLE HOOK FROM WORKS OF BERGEN PORT CHEMICAL COMPANY

Date	Gay-Lussac towers	Concentrating stills	Roasting plant
1.09			
Oct. 19	Reddish brown fumes containing nitrous gases, 1.30 P. M.–3.15 P. M.	Continuous white fumes, vapors and smoke.	Continuous bluish white fumes, varying in amount.
" 20	From 1.20 P. M. throughout day	"	"
" 21	....	"	"
" 22	12.30 P. M.–3.30 P. M	"	"
" 23	10.15–2 P. M	"	"
" 24	At 11.45 A. M	"	"
" 25	8 A. M.–9.30 A. M	"	"
" 26	....	"	"
" 27	....	"	"
" 28	Greater part of day	"	"
" 29	9 A. M.–9.30 A. M. and 11.45 A. M.–1.30 P. M ..	"	"
" 30	....	"	"
" 31	1 P. M.–2.15 P. M	"	"
Nov. 1	....	"	"
" 3	At intervals throughout day	"	"
" 4	At intervals throughout day	"	"
" 5	....	"	"
" 6	8 A. M.–3.30 P. M	"	"
" 9	During forenoon	"	"
" 10	....	"	"
" 11	....	"	"
" 12	....	"	"
" 13	9 A. M.–11 A. M	"	"
" 14	Throughout day	"	"
" 15	At intervals throughout day	"	"
" 16	At intervals from 11 A. M.–5 P. M	"	"
" 17	....		

APPENDIX I — *Continued*

TABLE SHOWING OCCURRENCE OF SMOKE AND FUME DISCHARGE ON CONSTABLE HOOK FROM WORKS OF GENERAL CHEMICAL COMPANY

Date 1909.	Gay-Lussac towers.	Smoke stack from furnaces and ovens of New Briquetting plant.
Oct. 19.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
20.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
21.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
22.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
23.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
24.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
25.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
26.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
27.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
28.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
29.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
30.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
31.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
Nov. 1.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
3.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
4.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
5.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
6.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
9.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
10.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
11.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
12.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
13.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
14.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
15.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
16.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.
17.	Occasional reddish brown fumes containing nitrous gases	Continuous white smoke and fumes.

APPENDIX I — *Continued*

TABLE SHOWING ATMOSPHERIC CONDITIONS DURING PERIOD FROM OCTOBER 19, 1909, TO NOVEMBER 17, 1909, WITH ESPECIAL REFERENCE TO INFLUENCE OF SMOKE, GASES AND FUMES ARISING FROM OPERATIONS ON CONSTABLE HOOK AS AFFECTING RICHMOND COUNTY

Date 1909.		Direction of prevailing wind.	Maximum velocity of wind. (Miles per hour.)	Temperature (Degrees F.)	Barometer	Weather conditions.	Remarks.
Oct.	19.	W.	23	42	....	Clear.	Strong oil and gaseous odors.
	20.	N. W. to S. W.	12	35	....	Clear.	
	21.	S.	27	44	....	Cloudy.	
	22.	W.	40	54–62	....	Cloudy.	
	23.	W.	26	48	29.90	Cloudy.	
	24.	N. W.	25	44	29.83	Cloudy.	Disagreeable gaseous and oily odors throughout day.
	25.	N. W.	25	38	30.00	Clear.	During early morning pungent oil and gaseous odors near New Brighton.
	26.	S. W.	17	42–52	....	Clear.	
	27.	S. W.	22	44	29.86	Partly cloudy.	Disagreeable oily odors in late evening from S. S. harbor station to New Brighton P. O.
	28.	W.	42	44	....	Partly cloudy.	
	29.	W.	46	34	30.06	Clear.	Slight gaseous and oily odors near New Brighton throughout day.
	30.	W.	33	34–48	30.22	Clear.	
	31.	S. W.	18	42	30.09	Clear.	
Nov.	1.	N. E.	17	48–58	30.22	Clear.	
	2.	S.	21	....	....	Cloudy.	
	3.	W.	26	54–58	29.82	Partly cloudy.	
	4.	W.	46	46–54	29.74	Partly cloudy.	
	5.	N. W.	34	41	30.16	Clear.	
	6.	W.	19	30–53	30.48	Partly cloudy.	
	7.	N. E.	15	....	30.70	Clear.	
	8.	S.	14	46–56	30.55	Cloudy.	

Nov.	9.	N. E.	14	38–48	30.57	Partly cloudy	Strong acid fumes and oily odors throughout day, especially noticeable from Snug Harbor to Livingston station.
	10.	S. E. and N. E.	16	40–48	30.72	Cloudy	Strong acid fumes and oily odors near S. S. harbor station in early forenoon producing irritation of the throat.
	11.	S. W.	15	42–61	30.50	Clear.	
	12.	S. W.	14	46–74	30.26	Clear.	
	13.	N. E.	26	59	30.46	Clear	Strong gaseous odors throughout morning.
	14.	S. W.	13	50	30.62	Cloudy.	
	15.	W.	17	48–58	30.40	Partly cloudy.	
	16.	N. W.	20	42–52	30.30	Partly cloudy	Slight gaseous and oily odors.
	17.	S. W.	....	52–58	29.74	Cloudy.	

Appendix II is omitted from this report.

REPORT OF AN INVESTIGATION OF VIOLATIONS OF THE PEEKSKILL WATER RULES

ALBANY, N. Y., *October* 20, 1909.

HON. CHARLES E. HUGHES, *Governor of the State of New York,*
Albany, N. Y.:

SIR:— In accordance with your request of October 15, 1909, and at the direction of Commissioner Eugene H. Porter, I beg to submit the following report on the present situation regarding the Peekskill watershed.

In order to fully understand the present situation, it will be well to review briefly the conditions on the watershed and action taken by this Department and the local boards having control of the water supply of the village of Peekskill, concerning the protection and improvement of their supply. The matter is one that has been before the Department for some years, and considerable correspondence and action has taken place between and by the board of water commissioners and local board of health, and the State Department of Health.

The matter was first referred to this Department as early as in the summer of 1907 when the question of procuring a better protection of the watershed of the Peekskill water supply was referred to the Department for advice, and that as a result of the advice given inspectors were engaged by them to investigate the conditions that existed at that time upon the watershed. As a result of the work of inspection carried on at that time, this Department was notified of the existence of a number of serious violations upon the watershed, more particularly those resulting from the camps of laborers employed on the New York water supply.

Upon receipt of such advices an order was issued at once by the State Commissioner of Health to the local board of health of the town of Cortlandt, in which the watershed is located, to take certain definite proceedings to remove the pollution at the camps referred to. In a letter from the secretary of the local board of health, dated July 16, 1907 (a copy of which is hereto attached and marked "A 1"), in reply, it was stated that an agreement had been reached with the board of water supply of New York city whereby all insanitary conditions would be cleaned up and the camps kept in proper sanitary condition. This was duly acknowledged by Commissioner Porter (see letter marked "A 2") in which the Secretary was asked to advise him if any further action was needed by the Department.

In February, 1908, as a result of the pollution that still existed on the watershed and notwithstanding the measures taken by board of water commissioners and local board of health, and the previous notices and warnings given by this Department through its orders to the local boards, an outbreak of typhoid fever occurred in the village, which was at once carefully investigated by this Department through its Engineering and Laboratory Divisions. The report of these investigations showed clearly that the outbreak of typhoid fever was a result of insanitary conditions on the watershed and contamination of supply from sources to which attention had previously been called and warnings given by this Department.

The report was transmitted at once to the board of water commissioners and local health officer together with letters again urging them to take steps without delay to remove the pollution from their watershed and abate all violations of the rules enacted by the Department in 1897 for the protection of their supply. They were also directed to issue notices to all water consumers in the village to boil the water, and further advice and assistance was offered them by the Department to assist in preventing a spread of the disease and to place their water supply in a safe condition. The water board was especially notified to reinspect conditions upon the watershed, serve notices upon any violations that might be discovered and report the same at once to this Department. They were further advised as to the explicit procedure necessary to be followed by them as provided in the Public Health Law, and their attention was called to the duties and their responsibilities resulting from the same; and were still further advised that, if they were not clear as to their powers and duties under the Health Law, they should consult with an attorney and take prompt action in the case of every violation that threatens a contamination of their water supply. The report covering the investigation of the epidemic of typhoid fever and the letters of transmittal and advices of the State Commissioner of Health are attached hereto and marked " B 1, B 2, C 1, C 2, and D."

Acting upon the advices thus given them, the Peekskill water board provided at once for a more thorough inspection and continuous patrol of their watershed. Violations were reported to, and were examined into, by the Department on February 28 and 29, March 10, April 9 and 10, and July 22, 1908, and orders were issued by the Department to the local boards of health to serve notices upon the violators — all in strict accordance with the provisions and procedure laid down in the Public Health Law, and the water rules enacted by this Department for the protection of their supply.

In addition to the orders, notices and advice given the local boards concerning their duties in cleaning up their watershed, the question of securing more effective protection of their public supply by the introduction of filtration was taken up by this Department, and conferences were had with the members of the boards of water commissioners and of health and addresses were given by members of the Engineering and Laboratory staff of the State Department of Health — all with a view of starting and carrying forward a movement to construct a water filtration plant. As a result of this campaign of education and the action of the board of water commissioners, expert engineers were secured to study the question of filtration of their supply, and a report embodying the results of their investigation was duly submitted to the officials of the village on May 1, 1908.

Following this report a proposition to vote funds for the construction of this filtration plant was put to the vote of the taxpayers and was carried at an election in May, 1908. At this time at the request of the board of water commissioners, the State Commissioner of Health transmitted a letter for publication in the newspapers for the purpose of inducing the taxpayers to vote favorably upon this very needed improvement. (Copy of this letter attached hereto and marked "E".) This letter reviewed the report of the consulting engineers on the filtration project, and, in general, the situation at Peekskill up to that time; and pointed out the imperative need for the installation of this filtration plant, and the necessity for every voter to perform his duty in voting favorably upon the project. This proposition for the construction of a filtration plant was carried, and as soon thereafter as practicable the construction of this plant was undertaken and has been in progress up to the present time.

Since that time and while the construction of this filter plant has been in progress the matter of continuing the cleaning up of the watershed has been continuously in progress, but notwithstanding the warnings, notices and advice of this Department to the water board in regard to removing the still existing violations of water rules upon their watershed, it appears that the water boards were not performing to their full extent, their duties in this regard; and in a letter from the Commissioner dated December 14, 1908 (a copy of which is attached hereto and marked "F"), the attention of the board was called to their failure in this respect, and their responsibility in the matter clearly pointed out, and, in order that the true condition of affairs would be known to the public, copies of this letter were sent for publication in the local newspapers.

Following this action this Department, through its Engineering Division, made a complete reinspection of all violations — forty-five in number — which had been reported to the Department during the year 1908 by the board of water commissioners on December 29, 30 and 31, and the report covering this detailed examination was made the basis of orders to the local boards of health in accordance with section 71 of the Public Health Law. This reinspection of these violations shows that of these forty-five violations, fifteen were found satisfactorily abated, seventeen partially abated, and thirteen were found unabated. On January 7, 1909, a copy of the report of this inspection containing the detailed descriptions of the violations on the watershed was sent to the Peekskill water board with letters urging them again to take immediate action to remove these violations.

On January 12, 1909, a letter was received from Mr. Edward Tice, dated January 11, 1909 (copy attached hereto and marked "G 1"), expressing appreciation of the prompt and efficient action taken by this Department in regard to the Peekskill supply and requesting advice concerning his activity in the case. In a reply to this letter (copy attached and marked "G 2"), the Commissioner advised Mr. Tice that a careful inspection of the watershed had recently been made, that the Peekskill board of water commissioners had been written in reference to what further steps they proposed to take, and that it was his intention to wait a reasonable length of time to hear from them before taking further action.

In reference to the letter of the Commissioner of January 7, 1909, referred to above, enclosing report of Engineering Division on inspection of all violations referred to the Department, a letter was received from Mr. Melvin R. Horton, president of the board of water commissioners, dated January 15, 1909 (copy attached hereto and marked "H 1"), in which he reported in full the strenuous efforts then being made by the water board to abate the violations referred to in the reports submitted to them, setting forth fully their reasons for the apparently slow progress made by them in removing these violations and describing fully the difficulties which they had encountered in carrying out this work. They particularly called attention to their inability to secure funds for the condemnation of property, stating that the taxpayers were unwilling to appropriate money for such purposes. They also pointed out the progress that had been made up to that date in the construction of new filtration works.

The reply of the Commissioner dated January 23, 1909 (copy attached hereto and marked "H 2"), while acknowledging with gratification the alleged efforts of the board of water commissioners in dealing with the situation, clearly pointed out the grave responsibility of boards and departments entrusted with the administration of duties associated with public health and cautioned them not to permit these important duties to be obscured or overshadowed by those of lesser importance, and urging on them not to slacken their efforts in removing any violations that still existed upon the watershed.

Letters dated April 8, 26, May 15, and June 10, 1909, were received from Mr. Tice, duly acknowledged in full by the Department concerning certain violations of the water rules which Mr. Tice alleged still existed upon the watershed. A letter was also sent to the board of water commissioners concerning these alleged violations and a report was received from them stating the conditions found to exist and the action taken by the board to abate them. (Copies of the above letters and replies are attached hereto and marked "I 1, I 2, I 3, J 1, J 2, K 1, K 2, K 3, K 4, K 5, L 1, and L 2.")

It is evident that even up to this time the water board had failed to remove entirely the violations from the watershed. It is also perfectly evident that the responsibility was entirely up to them, since all the procedure laid down by the Public Health Law concerning the removal of violations had been carried out to the point which placed the responsibility of adjusting the expense of removing these violations upon the water board and the necessity of their tendering the necessary damages or making other adjustments with those maintaining violations.

The claim of the board as previously pointed out was that the taxpayers would not vote the necessary money to carry on these condemnation proceedings and it is evident that they showed some hesitancy in caring to make these expenditures at this late date when the early completion of the purification works would give the village a safe supply and save them the expense of such proceedings. As a matter of expediency, it must be admitted that this attitude of the water board may be considered partly justified if the careful scrutiny which the water board claimed to have exerted over pollution upon the watershed was actually made, and in consideration of the fact that if infection actually occurred, it would in such an emergency be practicable to safeguard the public by warning them to boil their water during the short interval remaining before the filtration works would be in operation and their whole supply fully protected.

A letter under date of July 11, was received from Mr. Tice, in which he imputes a statement to Mr. Clark, the inspector upon the watershed, that there still remained some twenty violations, only one of which had been removed, and in the reply of the Commissioner Mr. Tice was advised that this statement is not borne out by the reports of the board of water commissioners who state that all of the six violations reported to the Department on April 26 have been abated or were not found to constitute violations, and that, if exceptions are taken to their report, he advised Mr. Tice to attend the meeting of the board of water commissioners and lay the matter before them, and that, if there are any twenty violations such as are alleged to exist, such violations should be brought to the attention of the water board at the same time. The reply of Mr. Tice to this letter states that he could not bring this matter to the attention of the water board as there was no meeting of this board until September. These letters marked "M 1, M 2, and M 3 constitute the last correspondence between Mr. Tice and this Department.

Reviewing briefly, then, the chain of events that have taken place at Peekskill with respect to the water supply and the conditions upon the watershed, and the various actions, orders, records and correspondence between this Department and the local board of water commissioners and of health, it will be seen:

1. That, following the enactment of rules for the protection of their supply in 1897, comparatively little attention was paid to the conditions upon the watershed in the protection of this supply until recent years, especially in 1907, when it was discovered that due to the natural growth of population upon the watershed and other activities in regard to the construction of the New York water supply, conditions of a serious nature concerning the purity of the supply arose which called for unusual activity on the part of the local board;

2. That, through the initiative and the persistent activity and official actions of this Department, every effort has been made through channels of advices, official orders, inspections, investigations, addresses, and other means of pointing out to the local boards having control of the water supply the necessity for unusual and continuous efforts and action on their part in removing from their watershed all sources of contamination, and of providing an effective barrier against such dangers by the installation of a water purification plant;

3. That, notwithstanding all these activities on the part of this Department, there was shown a lack of initiative and aggressiveness on the part of the local boards having control of the water

supply, to carry out these advices, orders, recommendations and warnings of the Department; and that as a result of this the village experienced an outbreak of typhoid fever in the early part of 1908;

4. That, since that time and as a result of these experiences a marked activity and attention to grave duties and responsibilities has been shown by these local boards and that, as the records show, a very marked improvement of the conditions upon the watershed has taken place.

5. That, in addition to this improvement in conditions upon the watershed, the village finally carried out the recommendation of this Department by voting the necessary funds and constructing a new and up-to-date filtration plant, and, that at this writing, the filter plant is completed and is undergoing official tests and will, according to advices just received from the water board, be put into continuous service in a comparatively few days. This will give the citizens of Peekskill one of the best supplies now furnished the municipalities of this State.

It may not be remiss to finally point out, concerning this matter of the Peekskill water supply, that so far as the records may indicate, the State Department of Health has performed to the best of its knowledge every duty imposed or implied under the provisions and procedure of the Public Health Law, concerning the removal of violations of water rules and regulations. The Department has not stopped, however, with performing merely these duties but has in addition, expended a greater amount of time and services in educating, advising, inspecting and reporting upon the various phases connected with the improvement of their supply than has been devoted to any other public supply in the State during these years.

The fact that conditions upon the watershed have been vastly improved notwithstanding a delay, and at times lethargy, on the part of the local boards in carrying out their duties; and that a filtration plant has been at least constructed and is being put into operation which should give the citizens of Peekskill a safe and pure supply of water, is ample testimony of the efforts exerted by this Department in this case. While the correspondence between Mr. Tice and this Department shows a commendable zeal on his part in regard to bringing to light possible dangerous pollution upon the watershed, it also shows, at the same time, a lack of sufficient appreciation of the operation of the Public Health Law concerning water rules and the removal of violations upon the watershed; and to the difficulty of cleaning up a watershed and at the same time constructing a filtration plant, when due consideration is given to the propriety and expediency of expending the public money toward these improvements.

With the new filtration plant now completed and ready to be put in service within a comparatively few days, and with the improvements that have already been made in removing pollution upon the watershed, the present situation at Peekskill with regard to their water supply is one which in my opinion need not give further apprehension. This improvement of conditions on the watershed is clearly shown by the last analyses of the water by our Laboratory Division, and it is evident that with the added protection to be given by the introduction of filtered water, the citizens of Peekskill will hereafter be furnished a safe and wholesome supply.

Trusting that this report will give you the information requested by you, I beg to remain,

Very respectively,

THEODORE HORTON,

Chief Engineer

INSPECTION OF RENDERING PLANTS

REPORTS OF INSPECTORS OF RENDERING PLANTS APPOINTED UNDER EXECUTIVE ORDERS

BARREN ISLAND

NEW YORK, *February* 1, 1910.

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.:*

The Sanitary Utilization Company.—During the year 1909 received and disposed of 537,855 tons of garbage from Greater New York, this being disposed of in the Brooklyn and New York buildings. *The New York building*, which was not operated in 1908, but during the year 1909 has been operated, has a total capacity of 1,560 tons per day. They have also installed four roller presses in this plant as an experiment; the results of same will be known later. *The Brooklyn plant*, operates with a total capacity of 2,080 tons per day; with this plant no additional improvements have been made. They have erected a fireproof building, which contains their tanks in connection with a naphtha percolating plant, which has been operated for the past few months for degreasing purposes, and is being operated at the present time with a fair degree of success. Steps will be taken to increase the efficiency of this plant immediately. The capacity of the naphtha system is sixty tons daily.

They are still making some slight improvements which are advantageous towards the sanitary conditions of the plant. The new chimney, which was erected there some two years ago, has been very beneficial in being able to take care of the gases, thus eliminating all the former complaints.

White Brothers.—Have been operating their plant continuously during the year 1909, without any mishaps, taking care of the offals from Greater New York, and the usual amount of gar bage from several of the large hotels. The number of carcasses removed to this plant is as follows:

Year Ending December 31, 1909

MANHATTAN

Horses	2,464	Cows	31
Donkeys	4	Calves	176
Colts	2	Cats and dogs	20,627
Ponies	1	Dogs, public pound.	35,745

BRONX

Horses	1,547	Ponies	4
Mules	1	Cows	22
Colts	1	Cats and dogs	11,997

RICHMOND

Horses	563	Cows	27
Mules	2	Cats and dogs	5,586
Donkeys	1	Dogs, public pound.	1,533
Colts	1		

This plant has been kept up to all the sanitary requirements, with a use of plenty of disinfectants; the buildings are cleaned and whitewashed, and therefore there is no cause for complaint. They have made some slight improvements, the principal one being the new evaporator to take care of the waters used in connection with the plant.

McKeever Brothers.— They have been receiving the offals from the boroughs of Kings and Queens, and the deliveries for the year are as follows:

BROOKLYN		QUEENS	
Horses	5,507	Horses	1,426
Cows	21	Cows	62

They have completed all their concrete work, except their boiler and engine room building, which will be done very shortly. During the year they have been running two boats along the coast and gathering in the fish known as the mossbunker. The improvements noted on this plant since the tearing down of the wooden buildings and the completion of the concrete buildings have brought this plant near to the sanitary requirements. They have several small improvements to make in regard to their condensers to take care of the gases, which will be required in the operation of this plant. With the concrete floors they are now able to wash the building thoroughly each day, so that there will be no opportunity for complaint.

Martin White Company.— Have taken over the old Coe Phosphate Works; they have commenced the manufacture of phosphate there, using the filler from the Sanitary Utilization Company and White Brothers as a mixture with the phosphate rock which they grind. As they have only started up lately, and as improvements are being made, a full report cannot be rendered at this time, but will be submitted to your Department each month.

The contracts which were formerly held by White Brothers for Manhattan, Bronx and Richmond and the one of McKeever Brothers for Kings and Queens, have been awarded by the health department of the city to the Van Iderstine Company, the same to go into effect on July first, but in the interim White Brothers and McKeever Brothers will continue to receive and take care of the offals as in their old contract.

At the time of submitting this report, there is a question pending as to possibility of taking the awarding of this contract to the courts for adjustment.

During the year there have been no complaints recorded against any of the plants, and it shows that careful attention has been given to them, and that they have complied with all requirements to protect themselves as well as the public.

B. F. HAMILTON,
Inspector

CHEEKTOWAGA

BUFFALO, N. Y., *January* 1, 1909.

EUGENE H. PORTER, M. D., *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR: The American Agricultural Chemical Co. (Milson Works) have kept their place in a sanitary condition and they have practically done about the same amount of business as they did for the year 1908. I could not get the exact figures from Mr. Kavanagh, the manager, as he said they were not completed yet, but he assured me in writing that he had handled about as follows:

Dry tankage stock, 26,000,000 pounds, miscellaneous material about, 5,000,000 pounds, 15,000 hides, skins, pelts, etc., fresh slaughterhouse stuff, carcasses, etc., over 4,000,000 pounds and over 2,000,000 pounds of horse, cattle, sheep and hogs and nearly 6,000,000 pounds of butcher shop fat, bones, etc. They have kept their works in a good clean condition at most all times and I have had no special complaints about them. They expect this year to do considerable more business than they did in the past. They did not spend anything special for improvements; only things they did in the line of repairs.

After the burning down of the Buffalo Reduction Co., the Buffalo Fertilizer Co., took up their work. Before that time they did no rendering for the first six months of the year but the last six months, after the reduction company fire they received 357 horses, 3,855 cats and dogs and 13 cattle and during the year 1909 they received and took care of 48,325 tons of green garbage. In comparing the last 5 months of 1908 with the last 5 months of 1909 they collected 1,832 tons more garbage or practically about 10 per cent. more. Everything at the works has been moving along fairly smooth. I have had several complaints about them drying fish; also the fertilizer dust coming down on the earth from one of their chimneys. They have built that chimney somewhat higher and have not had so much trouble with it since. I have made periodical visits to the plants and at any time there has been a complaint, I immediately went out and investigated it.

JOHN T. CLARIS,
Inspector

ROCHESTER

DECEMBER 31, 1909.

Hon. EUGENE H. PORTER, *Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I herewith submit my annual report as sanitary inspector of Rochester Tallow Works. This plant is located at the eastern boundary of the town of Gates within a few hundred feet of the city limits of Rochester.

This plant consists of two buildings, one containing the offices in the upper story and the rest of the building being used as a slaughter-house for beeves and sheep. The greater portion of the beef used by the Jewish trade is slaughtered here. The building is in good condition and kept cleanly. The president of the company, Mr. Benjamin Haag, acts as superintendent of the entire plant and shows great interest in obtaining sanitary conditions. The slaughter-house or factory No. 2 has killed during the past year as follows:

Cattle	8,200 lbs.
Calves	2,760 lbs.
Lambs	3,100 lbs.

The above are not owned by the company, but are killed for wholesale dealers at a small cost.

Factory No. 1 or the tallow works with which my work is more particularly concerned, has to do with the rendering of material obtained from tallow dealers, meat markets and slaughter houses. Material is brought in canvas covered wagons from the city after being collected from the various dealers and markets. This is placed in large tanks and rendered after the usual process. Inspection has proved exceedingly successful in this building. Conditions are bettering and not so many complaints have been received this year as heretofore. Suggestions are always agreeably accepted by the superintendent.

Inspections are made on the average of twice a week at uncertain hours, so that there is no attempt made to clean up for in spection. Often, visits are made after work is closed, and while oftentimes, suggestions are made which tend to increase the sanitary conditions, yet in general, there is a desire to keep the place in good condition. During the past year there has been rendered:

Market fat	708,559 lbs.
Slaughter-house fat	201,587 lbs.
Bones	112,808 lbs.
Suet	132,238 lbs.
Grease and scrap	226,400 lbs.

and as a result the products of the plant have been as follows:

Rendered tallow	1,288,380 lbs.
Tankage	551,560 lbs.
Dried and cleaned head bone	13,800 lbs.
Hoofs	15,170 lbs.
Horns	1,857 lbs.

The tankage is used for making fertilizer and shipped in cars direct from the plant, as are also the dried and cleaned bones, hoofs and horns. The shin bones are used for cutlery, while the other products are used for buttons and combs.

It would not be right to close this report without some reference to the fly nuisance. Immense numbers of flies are brought on the load of material to the plant. These flies come from the markets and some endeavor should be made in the first instance to prevent the access of flies to meat markets. After reaching the plant, the flies, of course, find bounties of food and warmth, and their presence has really become a serious question from a sanitary point of view. Along with Mr. Haag, we are now working on some practicable plan for exterminating the flies, if possible, or at least lessening their numbers, and I hope before the next report to have accomplished this result.

Very respectfully,

MONTGOMERY E. LEARY,
Special Inspector

SPECIAL INVESTIGATIONS

SPECIAL INVESTIGATIONS

The importance of making special investigations of certain conditions in addition to the routine work and duties of the Division, specifically required under the Public Health Law, cannot be overestimated when we stop to consider that the results of these investigations represent in a measure a working capital or foundation upon which much of the current work of the Division is based, and that being largely of an educational nature, they are helpful in creating a better understanding among the people of the needs of certain sanitary reforms.

The special investigations carried on during the past year have been largely extensions of the same or similar investigations taken up in previous years. Two of these special investigations have been referred to under the Protection of Public Water Supplies and descriptions of the remaining investigations will now be taken up under special headings of Sanitary Survey of Watersheds, Sanitary Conditions of Summer Resorts, Sanitary Conditions of Cities and Illegal Construction of Sewers.

SANITARY SURVEY OF WATERSHEDS

Sanitary surveys of the watersheds of the more important rivers of the State have already been made and the full reports covering them have been published in the annual reports of the Department for the years 1907 and 1908. These surveys included such principal rivers as the Upper Hudson, Mohawk, Black, Raquette, Oswego, Allegheny, Susquehanna and Delaware, the total watershed areas of which cover the larger and more populous section of the State. For this reason and in order to complete other investigations now relatively more important, less attention was given during the past year in extending this investigation. In fact, only one additional watershed, the Oswegatchie river, was investigated, and, although yet to be reported upon, this investigation will complete largely the northern section of the State which has been covered by these surveys.

The principal object sought by the sanitary surveys of these watersheds is the collection of full information of the location and character of the principal sources of sewage pollution of these streams. This information is made a permanent record and is valuable not only for ready reference in questions of stream pollution which continually arise in the routine of the engineering work, but enables the Department to form tentatively general policies with reference to its requirements for the disposal of sewage and wastes upon each individual watershed.

The information and records furnished by these sanitary surveys have been of such considerable value to the needs of the Department in dealing with the many problems relating to pollution of the streams of the State as to well justify the investigation and show the expediency of extending it, as time and opportunity permits, to the remaining watersheds of the State.

OSWEGATCHIE RIVER WATERSHED

ALBANY, N. Y., *November* 23, 1909.

HON. EUGENE H. PORTER, *State Commissioner of Health, Albany, N. Y.:*

DEAR SIR:— I beg to transmit the accompanying report of Prof. H. N. Ogden, special assistant engineer, covering an investigation made by him, of the sanitary conditions of the Oswegatchie river watershed.

This watershed, with the exception of the Raquette river watershed, is the most northerly one in the State which has been investigated so far by the Engineering Division and as shown by Professor Ogden, covers a district which is sparsely populated and, at the same time, used largely as a summer resort section. For these reasons, it is not surprising that comparatively little pollution is found upon the watershed and the conclusions and recommendations of Professor Ogden point out the necessity of curtailing present pollution and of conserving in the future the present comparatively limited pollution now entering the streams of this watershed.

From Professor Ogden's report of his investigation there appears to be little or no action to be taken by the Department at the present time, especially in view of the fact that in the few serious cases of pollution referred to in his report, action has already been taken so far as possible by the Department during the past few years. I, therefore, recommend that the report be filed as a record of the Department, and for future reference of the Engineering Division, in dealing with sanitary problems upon this watershed.

Yours respectfully,

THEODORE HORTON,

Chief Engineer

ITHACA, N. Y., *November* 15, 1909.

Mr. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— I have to submit herewith a report on the sanitary investigation of the Oswegatchie river and its watershed, the inspection having been done by Mr. C. A. Holmquist of the Department, during the months of June and July, 1909.

Location and Extent of Watershed.— The Oswegatchie river belongs to that group of rivers whose drainage systems empty into the St. Lawrence river and it occupies with its tributaries the southern half of St. Lawrence county and the northern part of Jefferson county. It has its source in a region of lakes and timbered swamps on the southern edge of St. Lawrence county and in the extreme northern parts of Hamilton and Herkimer counties. Cranberry lake, the largest of these upland lakes, has an area of thirteen square miles, while Bonaparte and Indian lakes, are each less than half this size. Black lake, about six miles above the mouth of the river, is virtually a widening out of the river, although its area is about seventeen square miles. The other lakes in the watershed are mere ponds, of little value for storage.

The river consists of four parts, known as the east branch, the middle branch, the west branch and Indian river, the final junction at the point where Indian river enters the main stream being only five miles above the mouth. The west and middle branches unite near Harrisville, their united waters entering the east branch at Dodgville, sixty miles above the mouth of the main river.

The general direction of all the streams is northwesterly, but both the east branch and Indian river, because of local topography, make abrupt deflections to the south, returning, however, immediately to their northern direction. On the former stream the apex of the bend is at the village of Oxbow and on the latter near the village of Evans Mills.

The following table gives the areas of the watersheds above different points of the river.

Table showing watershed areas above specified points on the Oswegatchie river.

Oswegatchie river above mouth	1,609
Oswegatchie river above junction of Indian river	1,577
Indian river, at junction with Oswegatchie river	544
Oswegatchie river, at junction of east and west branches.	630
East branch, above junction	358
West branch, above junction	272

Elevation of River at Different Points.— The elevation of the St. Lawrence river at the mouth of the Oswegatchie is 243 feet above tide and a succession of rapids and falls from the several sources to the mouth serve not only to discharge the storm waters rapidly, but also afford an abundance of water power distributed along the river.

Falls of 10 feet at Ogdensburg, 9 feet at Heuvelton, 8 feet at Rensselaer falls, 20 feet at Wegatchie, 18 feet at Natural Dam and 12 feet at Gouverneur, together with a number of lesser falls and rapids as yet undeveloped, indicate sufficiently the general character of this lower section of the river. At Rensselaer Falls, seventeen miles up stream from the St. Lawrence, an elevation of 52 feet above the latter is reached, an average gradient of

3 feet per mile. At a point twenty-four miles up, the difference in level is 65 feet, or an average slope of 2.7 feet per mile. Above Gouverneur, the country is more rugged and the falls higher and more frequent. At Cranberry lake, the elevation is 1,297 feet above the St. Lawrence and 1,540 feet above tide, while the small ponds at the head waters are above 2,000 feet in elevation.

The following table shows the available fall at each of the several mill sites on the main river and on each of its tributaries, as reported by the New York Water Supply Commission.

Table showing available falls in Oswegatchie river at points named:

Main River	Available fall in feet	Distance from St. Lawrence river in miles
Ogdensburg	10	1
Heuvelton	9	10
Rensselaer Falls	8	15
Wegatchie	22	48
Natural Dam	20	53
Gouverneur	12	56
Hailesboro	17.5	58
Emeryville	33	61
Dodgville	27	63
East Branch		
Taleville	18.5	66
Edwards	12	69
South Edwards	32	73
Oswegatchie	30	84
Newton falls	38	89
Cranberry lake		96
Middle and West Branches		
Fullerville	18	66
Harrisville	38	76

Indian River

Theresa	50	42
Evans Mills		50
Philadelphia	28	57
Antwerp	17	63
Natural Bridge	23	86

Surface Slopes.— The surface slopes of the area contributing to the streams are gently rolling except in the vicinity of Cranberry lake. The high mountains to the south are present limiting the watershed but there are not found on this watershed, in any part, the mountains whose steep sides make the Raquette river, adjoining and parallel to the Oswegatchie on the east, so rapid and torrential a stream. This is shown by the relatively low flow discharged over the dam at Ogdensburg at times of high water. The geological survey in 1902 gave as the maximum flood flow reported 15,500 second-feet from an area of 1,607 square miles, or 9.6 second-feet per square mile, although the Indian river flood flow of September 28, 1900, was 28.5 second-feet per square mile.

Topography and Geological Formation.— It may be said that the two tiers of townships bordering on the St. Lawrence are level. The streams at this point are sluggish or have but a moderate current and if they have falls, they amount to only a few feet. This condition extends twenty miles up from the St. Lawrence.

The next two tiers of townships along the watershed may be called hilly, the streams flowing with greater rapidity. The area lying in the southeastern part of St. Lawrence county may be termed mountainous, though by no means extremely so. Through this region the rivers flow with rapidity and we find upon them many heavy falls and even here some of them have long distances of still water and bateau navigation. The areas within Jefferson, Lewis and Herkimer counties are hilly, with the exception of the northeastern part of Jefferson county. We may regard the whole slope as facing the northwest.

The geological formation is precambrian metamorphic rocks and cambrian sandstone. The area back from the St. Lawrence to Black lake is of calciferous strata, then comes a strip of Potsdam sandstone about ten miles wide and parallel to the St. Lawrence river. The remaining area of the watershed which includes the sources of the tributary streams is of the metamorphic and igneous rocks, mainly gneisses' granites, gabbros and other plutonic and metamorphic rocks. Limestone is prominent in the southwestern portion.

Black Lake.— Black lake, which is really a widening out of Indian river, has an area of about seventeen square miles. It is about twenty-five miles in length and four miles wide at the widest part, near Bigge island.

Going up the lake from its confluence with the Oswegatchie, the right bank of the lake rises on an even slope to an elevation of eighty feet in four hundred feet. The surrounding country is covered with large, prosperous farms. There are no villages, only a few hamlets such as Edwardsville, Cedars and Black lake, having a combined population of about 150 persons.

With two or three exceptions, none of the houses and other buildings along the right shore of the lake, looking up the lake, are within 400 feet of the water's edge.

The left shore of the lake from the outlet, going up stream, is very flat and swampy. This swampy stretch is about ten miles long and two miles wide. This swamp is thickly overgrown with shrubs and small second growth timber and contains extensive peat beds.

From a point about ten miles up the lake from its confluence with the Oswegatchie river, the shore on the left becomes more and more rugged, broken and rocky. The rock is principally a gray granite. From this point to the head of the lake are six summer cottages and two or three small farms.

There are two small cheese factories located near the lake and which drain into it. Aside from these, there is practically no pollution of the lake.

Soil Conditions.— In general, the northern and western portions of the watershed have been influenced by glacial lake conditions. The uneven rocky bed of the old lake has been covered by layers of clay deposited in the early stages of the recession of the lake. The later period of withdrawal produced a layer of light, sandy loam. In the region of Black lake, the land is swampy, being rich in organic matter, but, on account of the poor drainage, cannot be cultivated. This presence of a large amount of decayed vegetable matter causes the waters of Black lake to be true to the name. From a water supply standpoint, this condition is objectionable, not so much from the danger of objectionable pollution, although there is some such danger, but more from the odor and color of the water that is inevitable under such conditions.

In the southeastern portion, the land is mountainous and produces abundant forests. In parts, the surface is a network of shallow lakes, grassy swamps and small streams. These conditions are favorable to water storage and timber growths, hence the abundance of pleasure resorts and hunting grounds.

Population.— The density of population within this area is low on account of the absence of cities or villages and the large amount of wooded or otherwise undeveloped regions. The density of population of the whole State, excluding cities and large villages, may be taken at fifty per square mile, while on the watershed of the Oswego river the density of population is ninety-eight per square mile. The area of the Oswegatchie river watershed is 1,609 square miles and the total population is 57,287 or 35.6 persons per square mile, a density less than the average of the whole State and less than one-half that found on the Oswego watershed. With the population of its one city excluded, the area has a density of only 27.4 persons per square mile. This low density is favorable to the purity of the water in these streams and should apparently allow these waters to be kept free from pollution and to be used for domestic purposes, should that be desirable.

The only city on the watershed is Ogdensburg, with a population of 13,179 but its location at the very mouth of the river makes its effect on the watershed unimportant. There are seven incorporated villages on the watershed, as shown in the following table.

Incorporated Villages on the Watershed of the Oswegatchie River

Village	County	Population
Antwerp	Jefferson	1,014
Edwards	St. Lawrence	438
Gouverneur	St. Lawrence	4,229
Harrisville	Lewis	780
Philadelphia	Jefferson	856
Richville	St. Lawrence	354
Theresa	Jefferson	892
		8,563

If, from the total population, 57,287, the population of those villages together with that of Ogdensburg be subtracted, the remainder is 35,545, a density of population on the entire area of only 22.1 per square mile, an evidence of the sparse settlement in this part of the State. About 62 per cent. of the total population, therefore, is resident on farms, in small hamlets and villages of a few hundred persons; 38 per cent. is resident in the villages and city and 23 per cent. in the city of Ogdensburg.

The following table shows the distribution of population in the several townships of the district.

Towns on the Watershed of the Oswegatchie River System, Showing Population of the Same by 1905 Census

ST. LAWRENCE COUNTY	Population
Lisbon (⅛)	500
Canton (1/7)	1,000
Oswegatchie	15,482
Depeyster	950
Dekalb	2,500
Hermon (⅓)	500
Morristown (⅓)	600
Macomb	1,245
Gouverneur	6,582

	Population	
Hammond (½)	930	
Rossie	1,119	
Fowler	1,756	
Edwards (⅞)	1,210	
Pitcairn	1,756	
Fine	2,371	
Clifton (½)	900	
Colton (1/10)	200	
		39,601
JEFFERSON COUNTY		
Alexandria (⅓)	1,320	
Theresa (¾)	1,500	
Antwerp	2,932	
Philadelphia	1,699	
Leray (⅔)	1,800	
Wilna (¾)	4,400	
		13,651
LEWIS COUNTY		
Diana	2,335	
Croghan (½)	1,500	
		3,835
HERKIMER COUNTY		
Webb (1/5)	200	
		200
Total		57,287

Volume of Stream.— No data is available by which the dry weather flow of the main stream or its distribution can be ascertained. The U. S. Geological Survey reports the low water flow at Ogdensburg as being 614 second-feet or 0.4 second-feet per square mile. This is comparatively large, the low water flow on the Oswego watershed being only 0.1 second-feet per square mile. This minimum flow allows about eleven cubic feet per second for each 1,000 persons, or fourteen cubic feet per second for each 1,000 persons, omitting the population of Ogdensburg.

At Heuvelton, at the lower end of the main river above the junction with the Indian river, the only low water flow recorded is 804 second-feet from an area of 1,027 square miles, or 0.8 second-feet per square mile, an amount double that for the whole river and an indication that the principal flow in dry weather comes from the main stream. This is confirmed by a single low water reading on the Indian river at Philadelphia, where the measured flow was 28.5 second-feet from an area of 216 square miles or .13 second-feet per square mile. The higher water on the main stream at low water stages is undoubtedly a factor in the development of the water power there, as well as a desirable influence in preventing any apparent nuisance in the river itself. The high dry weather flow and the sparsity of population when compared with other watersheds, indicate, without further more detailed study, that the waters of this river are not likely to become so polluted as to cause a nuisance for some time to come, but that whatever sanitary troubles may arise will be due to an infection of a drinking water or to local causes of public nuisances.

In the matter of the drinking water supply, the evidence of vital statistics at Ogdensburg is conclusive proof of the infection of this river. For many years this city has been content to drink the unpurified waters of the river with the result that its general death rate has been excessive, 28.1 deaths per 1,000 for the period 1902–7, while the death rate in the State for the same period was 17.6. This means an excess of about 10 per 1,000 population or 130 unnecessary deaths each year. The average typhoid fever death rate for the years 1887–1906 was 41.2 per 100,000, more than double a moderate and reasonable rate. The sanitary condition of the city, involving a discussion of these rates with the probable causes of the same, was made the subject of a special investigation in 1907 and the full report will be found on page 649 of Part II of the Department publication for that year.

The data and conclusions of that report indicate that the pollution of the water supply has been in the past the chief reason for the high death rates which have prevailed and that the pollution came partly from the immediate vicinity of the intake, within the city itself, partly from the village of Heuvelton, five miles upstream, and other small villages further away, and partly from the village of Gouverneur, whose sewers discharge the wastes of 4,000 people directly into the river. Typhoid is continually present in Gouverneur to excess, not at any time being reduced to a reasonable rate. During the past winter, steps have been taken in Ogdensburg, looking to a change of intake and to obtaining the water supply for the city from the St. Lawrence river instead of from the Oswegatchie. The sewage of Ogdensburg itself is not a menace to the river, except as it produces a local nuisance. The sewage of Gouverneur is the only other instance on the watershed of a public sewer system of any extent, discharging into the river. At Antwerp, Benson Mines, Emeryville, Philadelphia, Redwood, Richville, South Edwards and Theresa, may be found short lengths of private and semi-public sewers which together add some small amount of organic matter. But the largest of these eight villages has a population of only 1,000 and the total population is only about 4,500, or about the same population as Gouverneur. A purification, therefore, of the sewage of the one village of Gouverneur would affect one-half of all the sewage now discharged into the river and suitable restrictions on any further discharge from other villages to preserve the river from further pollution would easily maintain the good quality of the river for all future time.

Factory and Trade Wastes

Above Ogdensburg, the chief source of manufacturing wastes is the number of paper and pulp mills which are located at the several waterfalls. Lime, spent acids and wood fibre form the bulk of these wastes which in some places visibly contribute to the pollution of the river.

At Wegatchie, there is a woolen mill with twelve employees, which discharges some acids (sulphuric, acetic and formic) together with aniline and logwood dyes and with wash water used in washing the wool.

At Gouverneur, there is a large milk produce company, making butter, caseine, and milk sugar, using from 50,000 to 60,000 pounds of milk a day and discharging the wash water, some buttermilk and some washing powder into the river. In the same village there is a lace company, employing about 120 operators, which discharges caustics, acids, starch and soap.

At Edwards there is a cheese factory, the washings from which are discharged into the river.

At Antwerp there is a station of the National Milk Sugar Company, making about 1,500 pounds of milk sugar a day. The albuminous wastes are generally sold for chicken feed, but the washings go to the river. Here is also a cheese factory using 50,000 to 60,000 pounds of milk a day. The whey is used by the milk sugar factory just mentioned, so that the washings of vats and floors form the only waste.

On the upper part of the river are a number of talc mills where the talc mined in the vicinity is ground to powder. There is no pollution from these mills, however, except as the domestic sewage from the employees may reach the stream.

The following table gives in a condensed form, the data collected on the subject of the factories on this watershed.

TABLE SHOWING AMOUNT AND CHARACTER OF FACTORY WASTES DISCHARGED INTO THE OSWEGATCHIE RIVER

FACTORY	No. of employees	Amount of product	Character of wastes
		WEGATCHIE.	
Woolen mill	12	700 yards	Dyes and acids.
		NATURAL DAM.	
Paper company	80	30 tons paper, 16 tons sulphite pulp per day.	Waste from one and one-half tons sulphuric acid, one and one-half tons lime per day, wood fibre and wood refuse.
		GOUVERNEUR	
Foundry	25	One ton per day	Iron slag.
Saw mill	16	500-1,000 letter file boards per day.	None.
Saw and planing mill	8	Building supplies	Sawdust and shavings.
Marble finishing	26	12,000 cubic feet finished marble per year.	None.
Milk produce	25	Butter, caseine, etc., from 50,000 pounds of milk per day.	Wash water and water from vacuum pan; twenty-five pounds washing powder used per year.
Lace mill	120	2,800 pair curtains, 4,800 pair curtain nets and 700 sets of spreads and pillow cases, per week.	Thirty-five pounds caustic, 100 pounds chloride of lime, twenty pounds sulphuric acid, fifty pounds epsom salts, 100 pounds starch and ninety pounds soap used per day.
		EMERYVILLE.	
Paper company	40	Thirty tons ground wood pulp per day.	Wood fibre; sulphuric acid.

TABLE SHOWING AMOUNT AND CHARACTER OF FACTORY WASTES, ETC.— (Concl

FACTORY	No. of employees	Amount of product	Character of wa
		EDWARDS.	
Cheese factory	......	....	Washings.
		SOUTH EDWARDS.	
Tissue paper	8	Ground wood pulp	Wood fibre.
		NEWTON FALLS.	
Paper company	130–170	Thirty tons sulphite pulp and thirty tons bag paper per day.	Only 2 per cent. wa
Paper mill	22	Lumber	A very little sawd shavings.
Paper mill	8	Ground wood pulp	A very little wood fi
Paper company	16	Cut up logs for pulp	None.
		PHILADELPHIA.	
Lumber company	8–10	Sash, blinds and doors	Shavings and sawd
Chair company	20	Chairs	None.
		ANTWERP.	
Milk sugar company	5	1,500 pounds per day	Washings.
Cheese factory	32	Cheese and butter from 56,000 pounds milk per day.	Washings.
		HARRISVILLE	
Paper company	25–30	120 tons paper made per week.	Ground wood.
		OGDENSBURG.	
Barrel factory	10	4,000 barrels	....
Hardware and foundry company.	7	....	....
Gas works	6	17,000,000 cubic feet per year.	None.
Creamery company	3	Butter from 8,000 pounds milk per day.	Washings.
Brewery	16	5,000 barrels ale and porter.	Brewery wastes.
Manufacturing company.	32	Extension rods and fixtures for curtains.	None.
Lumber company	19–30	Sash, doors and blinds	None.
Water works	6	....	....
Light and power company.	3	Electricity	None.
Flour mills	24	400 barrels per day	None.
Roller mills	32	Flour	None.
Pump company	4	1,000 wooden pumps per year	None.
Mill	4	Sashes, doors and blinds	None.
Hub and spoke factory.	3	$6,000 per year	None.
Mill	5	3,000 bushels feed per week.	None.
Manufacturing company.	25	Doors, sashes and blinds	None.
Leather company	15	300 skins per day	Salt, hemlock, chr manure, sulphuri

Water Supply

Most of the small villages depend on wells for their wate
ply. A number of the mills have standpipes or tanks into
river water is pumped for fire protection, and it is possil
some cases, for this water to be used for drinking by the empl

Antwerp has a public supply pumped from the Indian
1,000 feet above the village.

Theresa pumps water from the Indian river for a public supply but its quality is so doubtful that well water is generally used for drinking purposes.

Benson Mines, through the Benson Company, has water from Little river, a tributary of the Oswegatchie, pumped to tanks and supplies the hotel and a few houses.

Newton Falls has a river water supply for fires and partial domestic use. Wells are generally used for drinking.

Edwards pumps water from the Oswegatchie for washing purposes and for fire protection.

Gouverneur gets its public supply from the Oswegatchie and supplies from this source three-quarters of its population with water for all purposes.

In conclusion, therefore, and as a summary of the investigations, it may be said that the natural purity of the Oswegatchie river is, as yet, not markedly interfered with except by the sewage of the village of Gouverneur and except by the wastes of certain woolen mills, cheese and milk sugar factories and pulp mills. The water is naturally dark-colored and has the appearance of considerable pollution but the minimum flow of the stream is two or three times that necessary to properly care for all the sewage from the watershed, even if concentrated at one point. A proper correction of those instances of local pollution which now exist and a reasonable restriction against further cases should clear up present opportunities for complaint and entirely prevent any reason for such complaints in the future.

Respectfully submitted,

H. N. OGDEN,

Special Assistant Engineer

INVESTIGATION OF SANITARY CONDITION OF CITIES AND VILLAGES

ALBANY, N. Y., *December* 6, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I have the honor to transmit herewith the reports of Prof. H. N. Ogden, special assistant engineer, covering his investigations of the sanitary conditions of the cities of Auburn, Binghamton, Geneva, Hornell, Ithaca, Mt. Vernon, Port Jervis, Oswego and the village of Port Chester.

The investigations of these municipalities represents a continuation of the work of a special investigation undertaken some two years ago of the sanitary conditions of certain municipalities of the State, the detailed reports of which have been published successively in the last two annual reports of the Department. In each case studies have been made of the topographical, geological, industrial and sociological peculiarities of the locality; of streets and pavements; of water, milk, and ice supplies; of the disposal of sewage and garbage; and an analysis of mortality statistics. These investigations have been of great value, for, based upon the findings and conclusions reached in each case, definite and valuable recommendations have been made to the local authorities.

In 1907 and 1908 investigations were made and completed of the following nine cities and villages:

Niagara Falls,
Ogdensburg,
Poughkeepsie,
Babylon,
Cohoes,
Corning,
Dunkirk,
Elmira,
Newburgh.

During 1909 reports were completed for three municipalities inspected in the latter part of 1908 and for six inspected during the past year, as listed below, the first three in the list being those investigated in 1908:

Mt. Vernon,	Auburn,	Hornell,
Port Chester,	Binghamton,	Ithaca,
Port Jervis,	Geneva,	Oswego.

It has been the custom to transmit these reports to the local authorities, and it is worthy of comment that in nearly all cases, immediate steps have been taken to carry out the recommendations and advice contained in these reports. For this reason I recommend that the same custom be continued this year and that the reports of investigations completed in 1909 be transmitted in the usual manner to the proper authorities of the respective cities and villages.

Very respectfully,
THEODORE HORTON,
Chief Engineer

AUBURN

ALBANY, N. Y., *October* 18, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— I have the honor to transmit herewith the report of Prof. H. N. Ogden, special assistant engineer, covering his investigation of the sanitary condition of the city of Auburn.

This investigation is one of a series of special investigations of the sanitary condition of the municipalities of the State which you have directed me to have carried out by the Engineering Division.

This report has been carefully reviewed by me and meets with my full approval, and I accordingly recommend that it be transmitted to the proper authorities of the city, urging upon them that careful consideration be given the report and that suitable action be taken to carry out the recommendations contained therein.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

ALBANY, N. Y., *September* 23, 1909.

Mr. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report covering my investigation of the sanitary condition of the city of Auburn.

History

The city of Auburn dates back to the time when the general subdivision of the western part of the State into townships took place. The soldiers of the revolution, in return for their services, were by the laws of 1789 given grants of land or lots of 600 acres each, located in the Onondaga Military Tract, chiefly in the counties now known as Cayuga, Onondaga and Cortland.

The present city of Auburn is located on six of these lots, and while no one of the original grantees came to live on their property, it was sold by them to pioneers who made their way into the wilderness and cleared for themselves homes. The first of these settlers seems to have been Capt. John L. Hardenburg, whose cabin was located in 1793 on the lot just back of the present city hall. His purchase of lot 47 was not accidental. As Captain on Sullivan's expedition and as a surveyor in laying out the lot lines, he had been in these woods and knew of the splendid water power in the outlet of Owasco lake, and he traded and bought till he had acquired possession of the lot containing the Owasco waterfalls. His first task, therefore, after building his cabin was to build a log dam and a mill, capable of grinding twelve bushels of grain a day. Later in the same year some dozen or more other settlers made clearings for themselves and the present city may be said to have been then started.

By 1800, every road leading to western New York was choked with emigrants, bound to the military lands and to the valley of the Genesee and a large number on the way settled in this vicinity. In five years more the hamlet had four taverns, a saw mill and a fulling mill, with a number of residences. A grand ball in Bostwick's tavern on July 4, 1805, graphically recorded, shows that the frontier days were already being forgotten. By 1810, there were seventeen little factories along the banks of the outlet, including five sawmills, four gristmills, two distilleries, two fulling mills, two carding mills, using power from six dams. By

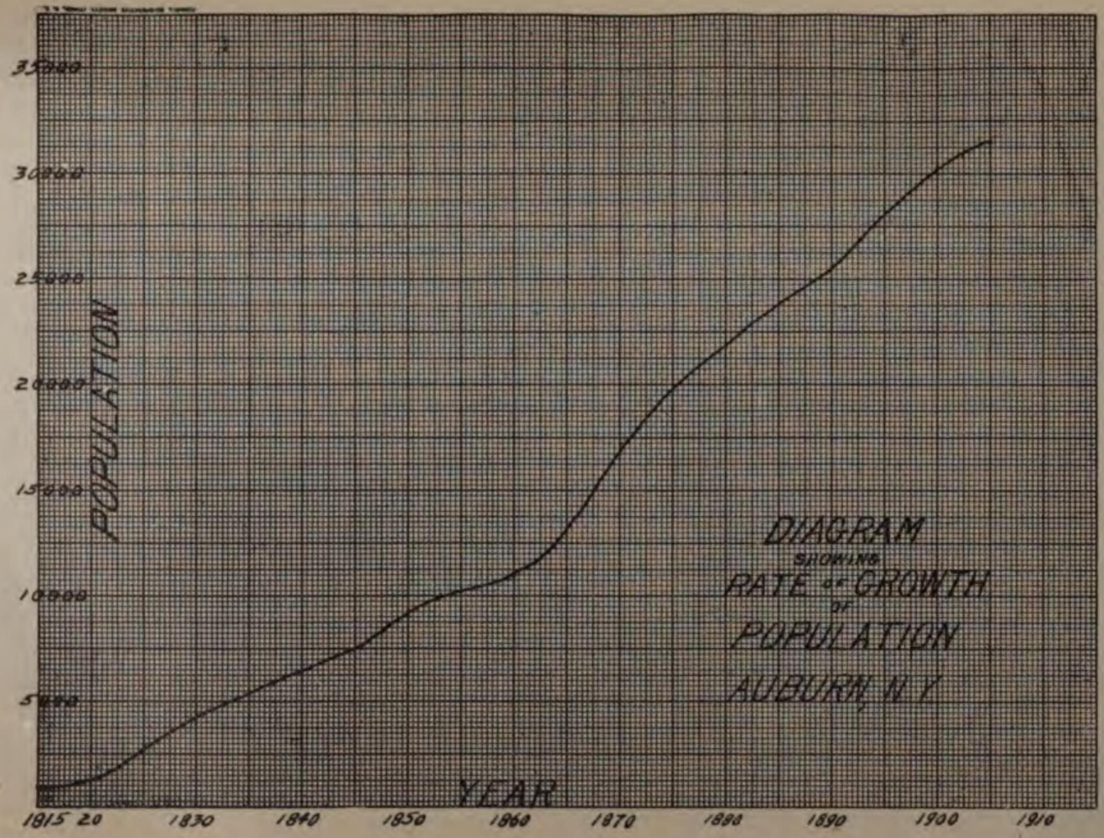


DIAGRAM
SHOWING
RATE OF GROWTH
OF
POPULATION
AUBURN, N.Y.
POPULATION
35000
30000
25000
20000
15000
10000
5000
YEAR
1815
20
1830
1840
1850
1860
1870
1880
1890
1900
1910

1815 there were 200 buildings and 1,000 persons in the village, which was duly incorporated. The streets in this year were full of activity, well travelled roads led out in all directions and its manufacturing made it the market for all the surrounding towns. It was decidedly in advance of all other places in western New York. Rochester had only a few log cabins. Syracuse was not yet begun. Geneva and Canandaigua, as old as Auburn, had not reached nearly the size of the latter.

The beginning of the State prison, in the next year, gave a new impetus to the village. Large numbers of mechanics were brought in for the work, which was carried on to completion in 1823, when $400,000 had been expended, a large sum for those days. In the year of its beginning, 1817, the Auburn Cotton Mill, now known as Nye and Waits, started operation, a substantial stone dam furnishing head for the water power, and paper mills furnishing large amounts of excellent paper followed soon after.

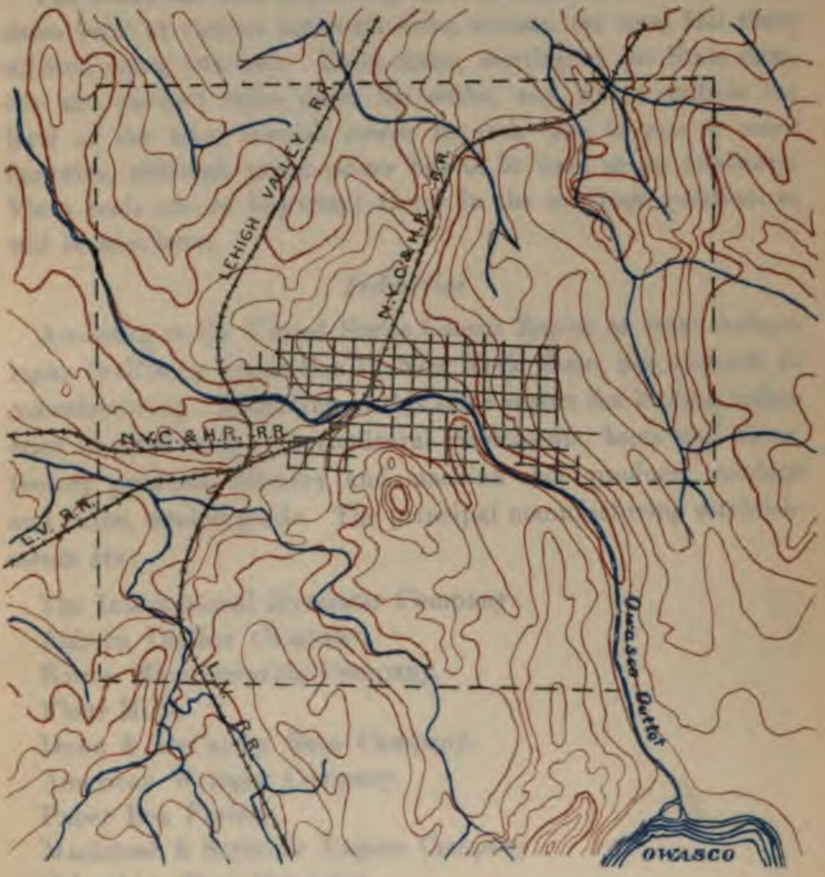
In 1820, Auburn's population had increased to 1,233, in 1825 to 2,982, and in 1830 to 4,486, in 1835 to 5,368, showing the rapid development of the village. As one historian describes it, in this last year, " the place was prosperous beyond precedent. Store houses, mills, hotels, public buildings and dwellings shot up into the air in every street, filling the latter with piles of brick, stone and lumber, and throngs of workmen and working teams filled the streets. Eighty new residences were built in this one year alone, and a four story cut stone block, known as the Seward Block, was built containing eleven stores, a magnificent addition to the business part of Auburn." In this same year were inaugurated the plans for railroads, one to Rochester and one to Syracuse, plans which were carried through at that time only by the persistent efforts of self-sacrificing citizens. In 1838 the line to Syracuse was opened for travel and three years later the road to Rochester was in operation. In 1850 the main line fifteen miles to the north of Auburn was built joining Syracuse and Rochester and leaving Auburn stranded on the " Old Road," but for ten years Auburn reaped the benefit of her railroad gifts. About 1850 the woolen mill, one of the present large industries of Auburn, was started, and, though it suffered some vicissitudes in its early days, soon proved to be an important addition to the factories of Auburn. In 1848, Auburn was made a city, having then 8,560 population, and in 1852 the city's prestige was still further increased by enlarging the outlet, digging through a bar in the lake, and generally improving the water power. In 1859 the waterworks company was organized, and the first pipes were laid in 1865, water being forced in by pumps of the Holley type.

The city was one of the pioneers in the use of gas as an illuminant, September 1, 1850, being the time when it was first turned into the city mains.

The brief sketch given traces the gradual growth of the city. Steadily and almost without interruption it has grown from the first log cabin in 1793. Due largely to the water power, manufacturing establishments have been started, attracting others in turn and attracting larger and larger populations. Today, besides the original east and west railroad through the city there are three lines to the south, two to Ithaca and one to Owego and Sayre, the latter extending northerly to Lake Ontario. A trolley road, splendidly equipped runs cars at half hour intervals to Syracuse and similar service is given to Rochester. Its municipal enterprises are well developed, its water and sewerage works covering practically the whole city. The streets are well cared for and the long streets are lined with handsome residences, showing the present prosperity of the old city.

Topography

Auburn is situated in about the center of Cayuga county and three miles north of Owasco lake. It is about twenty-seven miles southwest of Syracuse and seventy-five miles southeast of Rochester. The general elevation of the lake is 710 feet and of the city 700 feet above sea level. From the Owasco outlet, which flows through the center of the city in a general northwestern direction, a hill rises sharply from about 700 feet above sea level to 805 feet above sea level within a distance of about a half mile. The ground rises on both sides of the outlet so that good drainage is assured. In the eastern part of the city, the drainage is into a small brook known as Hunter's brook emptying into the Erie canal and the



Map of Auburn Showing Topography and Railroad Connections.

Seneca river fifteen miles north. The northern part of the city is much lower, is swampy in places, and is about 600 feet above tide. The northern part of the city drains into Crane brook, which flows northwest into the Seneca river.

The outlet has been artificially formed into a series of pools by dams built at various intervals down stream, the total fall there utilized being 160 feet. These dams, starting at the State dam, one and one-half miles down the outlet, and which controls the level of the lake, furnish power in each case to two or more factories, although steam power has to be used as an auxiliary. These pools are an important factor in the sewerage question, as will be seen later.

Industries

According to the United States Census Report of 1900 Auburn ranks twelfth in population in New York State, but eleventh in manufacturing. According to this same report the leading industries in 1900 were: Agricultural implements, boots and shoes, factory products, foundry and machine shop products, cordage and twine, woolen goods. The principal manufacturing establishments are:

The International Harvester Company.
Auburn Leather Company.
Bowen Manufacturing Company.
Flour Mills.
Dunn & McCarthy Shoe Company.
American Wringer Company.
Paper Box Factory.
Macintosh & Seymour Engine Company.
Columbian Rope Company.
Nye & Wait carpet works.
Forge and Iron shops.
Ohio Tool Company.
Bowen & Quick Manufacturing Company.
Golden Fleece Woolen Mills.
Twine Company.
Harmony Canning Company.

Some of these are important concerns of international reputation. The first establishment on the list has two plants and employs about 1,500 men. A number of other factories employ 500 or more men, and the size of the buildings, the number of operatives and the evident prosperity, all indicate to a casual observer the importance of manufacturing to the welfare of the city.

The total number of establishments in Auburn (1900) was 316, with a capital of $12,810,363, employing 6,530 wage earners who received $2,706,948 in wages annually. The value of products in Auburn was $10,591,109. The following table gives the number of employees and the value of products for four cities of about the same size, compared with Auburn:

	Population	No. of employees	Value of products
Elmira	35,672	4,914	$8,558,786
Schenectady	31,682	4,431	9,288,387
Kingston	24,535	2,685	5,280,478
Newburgh	24,943	3,926	6,497,088
Auburn	30,345	6,530	10,591,109

This table shows Auburn to be a little above the average in manufacturing, based upon population.

Then again, the number of wage earners is very much higher than in any of the other cities. This would naturally cause an influx of foreigners, bring with them their insanitary modes of living, and thus having the probable effect of raising the death rates.

The following table gives the number of children employed in the above cities:

City	No. of children
Auburn	152
Elmira	167
Kingston	21
Newburgh	81
Schenectady	45

This would tend to show that Auburn and Elmira employ a relatively larger number of children under sixteen years than other cities of about the same size, suggesting another reason for a high death rate.

Sociology

The following table gives the total population, native-born population, and foreign-born population in the five cities above-referred to:

City	Total	Native-born	Foreign-born	Ratio
Auburn	30,345	24,909	5,436	21.8%
Elmira	35,672	30,161	5,511	18.3%
Kingston	24,535	20,984	3,551	16.6%
Newburgh	24,943	20,597	4,346	21.1%
Schenectady	31,682	24,513	7,160	29.2%

This table does not show that Auburn has more than the average percentage of foreign population. The fact remains, however, that the percentage of foreigners in all of these cities is high enough to materially raise the death rate higher than it would ordinarily be were there no foreign-born inhabitants in the city.

In Auburn in 1900 the total population was 30,345, the total number of dwellings 5,709, and total number of families 6,813. This makes an average number of persons per dwelling of 5.3, while the average number of families per dwelling is 1.19. This is low compared with Cohoes and Schenectady, where there were 8.1 and 7.0 persons per dwelling respectively. Neither is the number of families per dwelling, 1.19, excessive. Then, also, from the same figures referred to above, we find that the number of persons per family is only 4.4, thus suggesting that the number of children in Auburn is below the average.

From the study of the sociology of Auburn it must be concluded, therefore, that the percentage of foreigners is high enough to materially raise the death rate, while the number of children is low enough to materially lower the death rate.

There does not seem to be any undue congestion in tenement-houses, which would argue in favor of healthful conditions of living. The living conditions in the city are, so far as could be judged by the inspection of the writer, not particularly insanitary, and seem to be free from the crowding peculiar to the larger cities. Even in "Little Italy," in the vicinity of South Division street, the houses, cheap wooden structures as they are, are separate, with front and back yards and with a general appearance of neatness. The health authorities have exerted pressure, in at least one instance, with the effect of closing up, a tenement so out of repair as to be unfit for use. The kind of manufactures do not generally lend themselves to unskilled labor, so that the workmen are intelligent permanent citizens and interested in the continued welfare of the city.

Mortality

The following table gives the general death rates of Auburn for the period 1900–1908. The populations have been interpolated between the U. S. census report of 1900 and the State census of 1905. The numbers of deaths have been taken from the bulletins of the United States Department of Vital Statistics and from the New York State Department of Health:

TABLE SHOWING GENERAL DEATH RATE IN AUBURN PER 1,000 POPULATION FOR 1900–1908, INCLUSIVE

Year	Population	Deaths	Rate Per M
1900	30,345	520	17.1
1901	30,560	420	13.7
1902	30,775	480	15.6
1903	30,990	530	17.1
1904	31,205	498	15.9
1905	31,422	517	16.4
1906	31,637	551	17.4
1907	31,852	536	16.8
1908	32,067	481	15.0

Average = 16.1.

The average annual death rate for the city of Auburn for the past nine years, according to this table, is 16.1. The following table gives the average rates for the ten states named for the five-year period 1903–1907:

TABLE SHOWING GENERAL DEATH RATES PER 1,000 POPULATION FOR CITIES IN NEW YORK AND OTHER STATES FOR THE FIVE-YEAR PERIOD 1903–1907

	1903	1904	1905	1906	1907.	Average	Final Average
New York	17.4	19.2	17.8	18.0	18.3	18.1	16.9
Connecticut ...	16.8	16.1	16.9	17.3	17.6	16.4	
Indiana	14.6	15.7	14.0	14.1	14.0	14.8	
Maine	18.4	19.5	17.9	18.1	18.9	18.5	
Massachusetts.	16.9	16.4	16.9	16.8	17.7	16.9	
Michigan	14.9	14.3	14.6	15.9	15.7	14.6	
New Hampshire	16.9	16.1	18.1	18.1	17.6	17.0	
New Jersey ...	17.4	19.0	17.5	18.0	18.2	17.9	
Rhode Island..	18.9	17.2	17.1	17.0	18.4	17.9	
Vermont	17.9	17.1	18.3	18.0	16.5	17.1	
Auburn	17.1	15.9	16.4	17.4	16.8	16.7	16.1

It may be remarked that the rates for Auburn, dependent as they are upon an assumed population, will vary, depending on the estimate of this population. For example, the report of the health officer, Dr. Brown, in 1907 gives the number of deaths as 539 and a death rate of 13.48, basing this rate on a population of 40,000, a number scarcely justified by the census figures of 1900 and 1905. In 1906, with the same population, and 550 deaths, he reports the rate as 13.75. It seems more reasonable to the writer, however, to assume that the rate of growth of population from 1900 to 1905 is continued to the present time.

It will be seen from the table above that the general death rate of Auburn is somewhat lower than the average for cities in the registration area of the United States. In fact, it is lower than the rate for the cities in any of the states except Michigan and Indiana, whose rates are 14.6 and 14.8, respectively. However, the very fact that the general death rate of Auburn is only .8 lower than the average for all these states indicates that it is higher than it ought to be, since it is manifestly certain that many of the cities in these states have too high a death rate. Since the general death rate may be the average of several very high and several very low death rates from particular diseases or causes, it may be that upon investigating, for example, the typhoid fever death rate, or the death rate of children under five, these will be found to be too high.

Turning, then, to the typhoid death rates of Auburn, we have the following table for the period of years 1900–1908:

TABLE SHOWING THE TYPHOID FEVER DEATH RATE PER 100,000 POPULATION IN AUBURN FROM 1901–1908, INCLUSIVE

Year	Population	Deaths	Rate Per 100,000
1900	30,345	12	39.6
1901	30,560	7	22.9
1902	30,775	3	9.8
1903	30,990	8	25.8
1904	31,205	9	28.8
1905	31,422	6	19.1
1906	31,637	4	12.6
1907	31,852	2	6.3
1908	32,067	16	50.0

Average=23.9.

Here the average is 23.9. In order to compare this with the typhoid rates of other cities of about the same size, the following table has been prepared, giving the typhoid fever death rates of a number of cities in New York State having about 25,000 population, for the five-year period 1903–1907:

Name	Population'	Typhoid Fever Rate
Amsterdam	23,943	26.2
Cohoes	24,183	77.0
Elmira	34,687	49.3
Jamestown	26,160	27.8
Kingston	25,556	22.4
Newburgh	26,498	40.3
Niagara Falls	26,560	144.4
Oswego	22,572	64.6
Poughkeepsie	25,379	79.3
Watertown	25,447	79.6

Compared with these cities Auburn, with its typhoid death rate of 23.9 would appear to be a city which is unusually healthful, and so it is — compared with these cities. Or, if we compare this rate with that of the whole United States Registration Area, namely, 32.2, Auburn would again appear in a favorable light. However, even this should not be satisfactory to an impartial investigator. A comparison is wanted, not with any certain restricted area which may itself be too high, but with an area which has a death rate, to the best of our knowledge, the lowest of all. Then, and only then, can we consider the relative sanitary condition of any locality as against that of the rest of the world.

The following, therefore, is a table which gives the average typhoid death rates of eleven countries of the world for the period 1901–1905:

Table Showing Typhoid Fever Death Rates per 100,000 Population in the United States and Other Countries

Country	1902	1903	1904	1905	1906	Average 1901–5
U. S. registration area...	34.4	34.2	31.9	28.1	32.1	32.2
Australasia	20.5	25.5	15.5	13.7	15.7	19.0
Austria	18.1	19.7	19.3	......	......	19.9
Belgium	17.8	15.6	14.9	13.7	......	16.8
Germany	7.0	7.3	7.0	6.3	......	7.6
Italy	34.6	35.5	36.9	32.7	28.1	35.2
Japan	11.4	9.8	10.8	13.2	......	11.6
Spain	45.8	43.4	44.4	37.7	42.2	44.5
Sweden	10.4	5.3	5.1	......	......	8.3
Switzerland	6.0	5.0	7.7	5.0	......	6.2
England and Wales	12.6	10.0	9.3	8.9	9.2	11.2

Now it is seen that the typhoid rate of Auburn no longer appears to be so low, in fact, outside of the United States registration area rate, which was considered before, the rate of Auburn is higher than that of any of the countries mentioned except Italy and Spain. The rate of Switzerland is 6.2, or just one-fourth that of Auburn. Switzerland, Sweden and Germany, all have rates below 10 per 100,000 population, and not one of the others except the three countries mentioned has a rate as high as 20. It is therefore evident that, considered as a part of the United States, Auburn has a very low typhoid death rate, but considered as a part of the world, Auburn has a high typhoid death rate. Considered from the standpoint of some of the countries of the world it is safe to say that a locality which has a typhoid rate above 10 per 100,000 annually should be viewed with suspicion, and every attempt made to improve the hygienic conditions.

It is well, too, to note that the typhoid death rate of Auburn fluctuates a good deal, namely from 6.3 in 1907 to 50.0 in 1908.

There were sixteen deaths from typhoid fever in 1908, which means about 160 cases of illness from that disease, approaching very nearly to an epidemic for a city of 30,000 inhabitants. This would suggest that some external causes are at work which are present in some years and not in others. For instance, an unusually high ground water may reach the level in which it may become polluted by the privies and the seepage of the sewage, and so wells may be polluted; or, the milk supply may vary in quality; or, the water supply from the lake under certain unique conditions of wind and stream in its tributaries may become so polluted as to be responsible for some transmission of disease.

Both impure water and impure milk have an immediate effect upon the health of infants. It will be of value, therefore to study the death rates of children under five. The following table gives for the period 1900–1908, the death rates of children under five per 10,000 population:

TABLE SHOWING DEATH RATES PER 10,000 POPULATION IN AUBURN FOR CHILDREN UNDER FIVE YEARS

	Population	Deaths	Rate per 10,000 pop
1900	30,345	138	45.5
1901	30,560	83	27.2
1902	30,775	100	32.6
1903	30,990	91	29.4
1904	31,205	99	31.6
1905	31,422	121	39.6
1906	31,637	123	38.9
1907	31,852	101	31.8
1908	32,067	126	39.4

Average=35.1.

The average for these years is 35.1. Here again we apparently have a low rate, the normal rate for the registration cities in the United States being 49.6 for 1900 (U. S. Census Report).

From English statistics we have the following rates of death for children under five during the period 1840–1880, inclusive:

Year.	Rate
1841-1850	66.15
1851-1860	67.58
1861-1870	68.30
1871-1880	63.12

There is therefore no doubt but that the death rate for children is unusually low in Auburn, and this indicates one of two things: Either the conditions in the city are really healthful for the development and growth of children, or there is small proportion of the children themselves. In investigating this further let us see what the ratio of deaths under five to total deaths is in Auburn. The following table gives these ratios for the period 1900–1908:

RATIOS OF DEATHS UNDER FIVE TO TOTAL DEATHS FOR THE CITY OF AUBURN FOR THE PERIOD 1900–1908

Year	No. deaths	Under five	Ratio
1900	520	138	26.6
1901	420	83	19.7
1902	480	100	20.8
1903	530	91	17.1
1904	498	99	19.8
1905	517	124	24.0
1906	651	123	22.3
1907	536	101	18.8
1908	481	126	26.2

Average=21.7.

Again we are confronted with an average, 21.7 per cent. which is considerably lower than the percentage of deaths under five to total deaths in cities where the proportion of children is normal, namely 30 per cent. In the registration area of the United States in 1906 there were 444,288 deaths at all ages and 132,273 deaths under five, or a ratio of 29.9 per cent. In Massachusetts, for the same year there were 50,431 deaths from all causes and 14,902 deaths under five, a ratio of 33.8 per cent. and in New York State in the same year the corresponding ratio was 35.4 per cent. This would tend to show that the number of children in Auburn is below the average. Of course, if the proportion of the children under five to total population in Auburn is below the normal the general death rate is immediately affected, since the death rate for children is higher than for adults, and in that case the general death rate would not be so satisfactory.

The result of these studies of mortality in Auburn shows that city to be apparently healthful when considered merely in the light of other typhoid rates in the United States, but when viewed in the light of rates the world over, the Auburn typhoid rate appears too high and suggests impure milk or impure water. It has been shown that the number of persons per family is only 4.4. This fact coupled with the fact that both the death rate among children under five and the ratio of deaths under five to total deaths are low shows almost conclusively that the number of children in Auburn is below the normal, which fact tends to counteract the effect of the high typhoid rate and results in the apparently low general death rate.

It is now necessary to consider the various factors which go to make up the sanitary or insanitary condition of the city of Auburn in order to determine which one of these, or which combination of these, it is which is causing the high typhoid death rates.

Milk

The milk supply of Auburn may be fairly said to be unusually well cared for. The ordinances relating thereto are comprehensive and judicious and the work of the inspector is apparently thorough and calculated to secure their efficient fulfillment. Section 5 provides that all would be dealers shall apply for permission to sell milk or cream and that no person shall sell or deliver milk or cream without a license issued by the Board of Health. No milk shall be delivered at any house that has in it any contagious disease. No person shall bottle milk or cream in the delivery wagon, nor in any place except the milk house. No milk tickets may be used more than once. All milk wagons shall be properly covered with canvass and shall have the name of the owner and and the number of the license conspicuously painted thereon. No person shall bring into the city, or sell or deliver milk or cream which is produced at any farm, the owner or manager of which refuses to comply with the dairy rules promulgated by the board. This last rule is of most vital importance, since it gives the inspector an opportunity of inspecting the farms. He states, if objection is made to his inspection or to carrying out his recommendations, that he cannot insist; that the producer may do as he pleases; but that under the laws, the farmer's milk may not be sold in Auburn until the farm has been inspected and the improvements suggested, if any, carried out. A fine of $50.00 is imposed on any dealer distributing milk from any farm not approved.

The dealer, applying for a license makes a sworn statement of the producers from whom the milk is obtained. Before the license is granted each year, the inspector visits the farm and makes a detailed report of the conditions and of the compliance or non-compliance of the farmer with the Dairy Rules. No scoring is done, but a complete statement is recorded of all the surroundings affecting the cleanliness of the milk. That this is faithfully done may be inferred from the fact that in 1907, 317 farms were inspected, with forty milk dealers licensed and that there has been a decided change in this regard may be seen by comparing these figures with those for 1904, when seventy-four farms were inspected and eighty-three dealers licensed.

The milk supply comes from about 700 separate farms from within a radius of about ten miles; to distribute this milk there are thirty-five dealers, the largest, viz.: the Cayuga county dairy, taking milk from 108 of the farms and handling 6,000 quarts daily. The other dealers do comparatively small business, though one firm distributed 700 quarts and another 500 quarts, daily. The others handle from 10 to 200 quarts each. Copies of the statements submitted by the milk producer and by the dealer are submitted herewith, and also a copy of the report card of the Health Board inspector, who examined all the farms annually before the license is issued. The Cayuga county dairy company pasteurized or claim to pasteurize their milk before it is distributed. It may properly be said that the milk supply of Auburn is in good sanitary condition.

Garbage

The garbage of Auburn is collected under a contract which provides that the contractors shall collect putrescible matter from houses and stores twice a week from April and November and once a week from December to March. The wagons used are furnished by the city, having tight boxes and being suitable and satisfactory. The contract provides that the wagons are to be washed and disinfected daily, that the garbage is to be buried, so as not to be a nuisance or objectionable, in trenches, four feet wide and four feet deep when so designed; otherwise plowed under or buried as may be directed. Section 8 of the Sanitary Ordinances prohibits any garbage or putrescible matter from being placed in or run into any street, gutter, sidewalk, or public place, under penalty of $50.00. Section 10, requires that any vehicle carrying garbage, slaughter house offal, night soil, etc. through the streets shall have a license from the Health Department and shall be so labelled. Section 13 prohibits the mixing of garbage with papers, rubbish or tin cans and provides a fine of $50.00 if garbage or other offensive house waste is thrown or allowed to remain upon the ground or property near or adjacent to any residence or store. That the Department is active in seeing that these rules are enforced may be inferred from the fact that in 1907 the inspector visited 897 premises, abating 671 nuisances, largely resulting from collections and deposits of garbage. About twelve two yard loads of garbage are collected daily — half of it being drawn to a farm to the northwest of the city, about two miles out, and half to a farm the same distance away to the east of the city. At the time of the writer's visit, the day's collection of garbage was spread in a thin layer on the ground and then ploughed under. No offensive odor was perceptible, although under certain weather conditions some odors must arise.

Dead animals are carried to a rendering establishment at the end of Allen street where the bones are cleaned and dried, the fat separated, and hides salted, and the flesh boiled down. This place is foul beyond description, and except that it is 1,000 feet or more from houses, and is just across the city line in the town of Aurelius, would doubtless have been modified by the local board of health. Complaints have been made of its conditions, but it is not in the jurisdiction of the local board. It is a nuisance, however, and should be remodeled.

Sewerage

The sewers of Auburn are, except in the case of two small systems recently built, on the combined plan and discharge into the Owasco Outlet. They have been built and added to for a hundred years past, some of them almost forgotten, so that their size or grade is a matter of guess work. The map of the city appended shows that the city is well sewered and that there need be no dangers from cesspools or privies if only householders choose

to make the necessary sewer connections. The sanitary ordinances prohibit any privy or cesspool within the inner fire district (the business part) of the city; forbids them in any part of the city nearer a party line than fifteen feet or nearer a house or store than twenty-five feet. All house drains on streets where water and sewer pipes are laid are required to connect all plumbing fixtures with the sewers, and all future construction of cesspools and privies is forbidden if sewers are reasonably available for connection. Privy vaults where constructed are required to be watertight. These rules are enforced in the business district and all privies there have been removed. Elsewhere there are many, even when prohibited by ordinance.

The unfortunate and deplorable element of the sewerage of Auburn consists in the present method of disposal and the resulting pollution of the Owasco outlet by the discharge from the old sewers. The following statement by O. H. Landreth (twenty-fourth annual report, page 189) gives a clear account of the conditions existing at that time.

Professor Landreth says: "This report (of Mr. Brown, quoted below) so accurately states the conditions and has been so fully verified by experience, as my inspection undoubtedly indicates, that it has seemed proper to quote from it as above. Since it was made on a complaint concerning local conditions in Auburn only, it did not deal with conditions below the city, except to refer to the probable necessity for the construction of disposal works in addition to intercepting sewers. My examination has, on the other hand, been directed largely to the conditions which prevail on the stream below the city, and their cause in the city of Auburn, and originated in complaints of these conditions made to the State Department of Health.

"At Port Byron the public water supply, which is taken from the Owasco creek, is absolutely unfit and unsafe for any potable purpose whatever, and its use for other purposes in habitations is attended with danger, as it is impossible to thoroughly prevent it occasionally being brought into such situations as to make it an avenue of infection from the foul stream. The residents are compelled to adhere to the use of wells, many of which are unsafe from their proximity to privies and cesspools, as there is no sewer system in the village. In addition to the danger to the water supply, the stream is so foul that the odors from it in warm weather are exceedingly objectionable and even dangerous to health in the cases of individuals of low physical resistance. The driving out of all fish and the injuries to agricultural and manufacturing interests, while serious matters affecting the liability of the city of Auburn for damages covering such injuries are not strictly matters affecting the public health and therefore only bear on the present consideration in the way of emphasizing the importance to the city of taking early steps to clean itself of the liability by removal of the causes. In view of the serious liability under which the city stands in relation to the public health and property rights of residents and interests on the stream below the city, and also in view of the serious insanitary condition of the outlet in relation to the public health and interests of the city itself, I consider it of the highest importance that the city should begin at once the steps necessary to relieve these two undesirable relations. Ultimately, and possibly within a short time, this will mean the construction of sewage disposal works for the treatment of the sewage of the city before discharging into the outlet; but before such construction is commenced, it will be necessary to make considerable change in the present system of sewers to accomplish (1) the separation of storm water from sewage proper, in order to reduce the volume of sewage to be treated to a minimum; and (2) to construct some intercepting sewers to unite the present numerous outlets into one or two main outlets in order to reduce the number of disposal plants to the smallest number possible. The storm water can, of course, be discharged into the nearest watercourse, but all sewage and manufacturing refuse should be kept out of the stream and led to the site of the disposal works. The first cost of these works and the annual cost of operation will be approximately proportional to the volume of sewage treated and to the degree of purification demanded, and will be practically independent of the quality or at least the strength of the sewage; it will therefore be good economy to reduce the volume of sewage to the minimum amount by diversion of all storm water, roof water, and by the reduction of water waste to the least possible. The matter of the introduction of treatment works is simply a question of time, but must inevitably come in the near future."

Since then two forward steps have been taken in the direction pointed out by Mr. Landreth. A sewage disposal plant for the sewage of a part of the city has been built and connected with sewers laid in the area drained, known as the fourth, fifth, sixth and seventh wards sewer district, as shown on the sewer map attached.

There are a number of laterals yet to be constructed in the area and a number of house connections to be made, but this northwest section of the city, since the spring of 1909, has had its sewage properly treated and discharged without nuisance or danger.

In 1892 Professor Brown reported to the Department as follows:

"The city of Auburn is not yet completely sewered and new sewers are constructed from time to time discharging into the outlet, thus increasing the amount of pollution. The tendency is for the millponds to fill up by the deposit of the heavier matters. This tendency will increase. At times of high water there is some tendency to remove these deposits, on account of the larger amount of water flowing and its freer use by the factories through their mill races. The deposits in the eddies and more quiet portions of the ponds are not greatly disturbed, and there is no doubt in my mind that the millponds will become of less value for the storage of water from year to year, on account of this filling up. The nuisance in the dams at times of low water will therefore become greater from year to year. It is impossible to permanently and largely increase the low water flow from the lake, and no manipulation of the flow will stop the deposits of solid matter in the ponds. The preliminary report recommended that the ponds be kept nearly filled. This recommendation was offered for temporary relief only. So long as sewage is discharged into the stream the capabilities of the ponds for producing the nuisance will increase. It will finally become impossible to keep the bottom of the stream covered beyond the possibility of producing such a nuisance. It is evident in some places even now that the water itself is so seriously polluted as to become a source of complaint. As the amount of sewage discharged into the stream increases, the pollution of the water will increase, until within a few years the water itself will produce an intolerable nuisance without any aid from the uncovered deposits on the bottom. * * * The in-

Again, during the winter of 1908-9, plans were
authority given to proceed with the construction of
system and a disposal plant for a large area of the
city now draining into Hunter's brook. This brook
polluted by the few sewers already built in this a
construction of the additional sewers needed in this fir
tenth wards district now under way, together with
disposal plant, will be a great improvement, so far a
concerned. The construction of an intercepting sew
outlet, and of a disposal plant to care for the sewag
the interceptor, is an important and extensive unde
one which Auburn must surely undertake for a satis
pletion of the sanitary improvement of the city.

Pavements

The pavements of Auburn are distinctly divisil
classes, good and bad. Brick pavements and bitu
cadam are the two kinds used and, while the former
good, the latter are in many cases bad. Many depr
been formed in the wearing coat, and these have de
large holes, extending well into the foundation. Th
these latter have under their contract been required t
in good condition and after the street surface has

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paved are washed instead of swept, and the result, whatever may be the effect on the life of the pavement, is assuredly beneficial in eliminating dust from the pavement. In the central part of the city each night, beginning at the outer edge of the business district and working in to the center, two gangs of three men each, with hose and cart and about 300 feet of fire hose, work from hydrant to hydrant, flushing the street from side to side and washing all dirt ahead of the stream down hill. Every street is thus washed three times a week, and some oftener. A team follows to pick up any accumulations which may be stranded in the gutters or on flat grades. The result is that the pavement is left clean, all dust is eliminated and no organic matter is left on the street to putrify. The city of Syracuse, which also washed its streets some years ago, has given up such a procedure because, so the writer was informed, the pavement, even when of brick, rapidly deteriorated under the practice. It is of interest to note, however, that the city of New York has recently appropriated a large sum for experimental demonstration of street washing machines, and a study is to be made of machines, their efficiency and effect both being considered.

There are seven miles of paved streets in the city — 6.3 miles of brick and 0.7 miles of bituminous macadam. There are about seven miles also of macadam which are cleaned up once a year, in the spring. The city provides one man for each of the ten wards, who are regularly on duty to keep papers and rubbish picked up and to keep the gutters clean. The dry street sweepings are used for filling around the city, in vacant lots and elsewhere. A dump in West Genesee street is used not only for street sweepings and ashes but also for garbage, a practice which is of manifest discomfort to the residents in the vicinity.

Sprinkling is done by contract on streets designated by the council but paid for by the abutters. Sprinkling is also done on streets where petitioned for by two-thirds of the abutters; that is, practically on all improved streets.

Ice

The ice supply of Auburn comes chiefly from Cayuga lake, although some is also harvested from Lake Ontario and from

Owasco lake. The latter lake does not freeze readily and in exceptionally cold winters only is that ice available. The largest dealer is known as the Independent Ice Company, formed in April, 1908, by an association of three firms, viz.: Shannon & Company, C. E. Eldridge, and Compton & Thornton. The Independent Ice Company, reporting as such the amount of ice on hand for the summer's demands, make an affidavit that on April 1, 1909, they had 2,500 tons of ice cut from Cayuga lake stored in a stack at Cayuga and that they had 4,000 tons cut from Lake Ontario stored at North Fair Haven. The original firms also have ice still on hand, viz.: Shannon & Company had 7,000 tons of ice in their ice house on Barber avenue and 4,000 tons at Cayuga, all cut from Cayuga lake during the winter of 1908–9; C. E. Eldridge had 200 tons in his icehouse on Mechanic street cut from Owasco lake in March, 1909; and Compton & Thornton had 1,500 tons in their icehouse, cut from Owasco lake in the winter of 1907–8.

The other ice company is known as the People's Ice Company, formerly W. N. Henderson Ice Company. This concern reports on April 1, 1909, 10,000 tons of ice stored in icehouses at Auburn, cut from Lake Ontario. All the sources of ice are apparently free from pollution, without sewage contamination, and the ice should be a good quality of natural ice.

Water Supply

The original water supply of the city of Auburn was taken from the lake outlet at a point near the State dam, about 9,000 feet below the lake. The water was pumped from here directly into the pipes of the city without the intermediate use of reservoir or standpipe. In 1883, on account of the dangers of pollution in this outlet, a 24-inch pipe was extended upstream into the lake and a second pumping station erected on a pier 1,000 feet from the shore with a 30-inch W. I. intake extending 600 feet further into the lake to a point where the water was about fifteen feet deep. The water was thus pumped to the lower station over a ridge about seventeen feet above lake level. In 1907 a new intake 36-inch diameter was carried out into the lake a distance of 1,875 feet to a point where the water is forty feet deep, which intake

has been in use since it was laid, although it is possible to still use either the shorter lake intake or the original intake at the lower station if desired.

At the upper station is a duplex Holley pump of a capacity of 7,500,000 gallons daily, driven by an 80 horse-power Corliss engine (1893), and a Snow steam pump of a capacity of 10,000,000 gallons (1907) with duplicate boilers.

At the lower station is a Gaskell pump of 7,500,000 gallons capacity (1882) operated by water-power when possible. For this there are three wheels, operating under a maximum head of fourteen feet. There is also an R. D. Wood duplex pump 10,000,000 gallons capacity, and in case of insufficient water-power one 550 horse-power McIntosh and Seymour compound condensed engine with three Erie boilers of 125 horse-power each. The distribution starts from the lower station by a 24-inch pipe to the western and southern parts of the city and by an 18-inch pipe to the eastern and northern parts. The systems are well tied together, however, so that there is a general mixture of the waters throughout the city. The map appended shows that the city is practically all supplied with water and streets shown without pipes are as yet not built upon.

Owasco Lake, from which the water comes, is about ten miles long, from one to one and a half miles wide, and about 100 feet deep. The inlet is the principal tributary and has a drainage area of about 118 square miles. Besides this Dutch Hollow brook, with a drainage area of twenty-nine square miles, enters the lake on the east, three and a half miles above the outlet. Nearly opposite each other and almost opposite the water intake are two small brooks, one on the west known as Van Ness brook, and one on the east known as Sucker brook.

Upon the watershed of the lake 195 square miles is a population of approximately 10,000 persons, or about fifty per square mile. This includes the population of the three villages of Moravia, Groton and Locke, which all discharge into the inlet, and the two villages of Niles and Owasco on Dutch Hollow brook. They have in no cases public sewer systems, but private sewers are in use in all of the places. On the banks of the lake are about 200 cottages with two small hotels, one at Cascade at the south end and one at

Ensinore, eight miles from the water intake. The menace to the purity of the water comes therefore from two sources — from the cottages on the shore, the wastes from which may find their way into the waters of the lake, and from the villages above named, chiefly Moravia. The cottages and the entire watershed are patrolled by two inspectors of the waterboard, who have in a most painstaking way inforced the rules enacted by the State Board of Health in 1906 to protect the water supply of Auburn. Privies have been moved. Watertight boxes have been substituted for leaky ones, barns and barnyards have been moved and great care has been exercised to secure, so far as an inforcement of the rules could do so, freedom from pollution. The two hotels are provided with large cesspools and no direct contamination from the cottages seems likely. Any pollution from Groton, Locke and Moravia must pass through five miles of inlet with a sluggish current and through ten miles of lake where the velocity is practically nothing. Mr. G. C. Whipple gives it as his opinion, however, that at certain times of the year, dependent on the stratification of the lake and the volume of water brought down the inlet, that there is grave danger of the water supply of Auburn being contaminated as a result of the pollution of the inlet at Groton, Moravia and elsewhere. He also believes that the supply is menaced by the privies near the shore of the lake, especially those in the vicinity of the intake. There is no doubt that such danger exists, just as danger always exists in using any surface supply, but the writer cannot help but feel that the lake, acting as a sedimentation basin, reduces those dangers to a minimum, and after having visited practically every one of the 200 privies along the shore the writer feels that they are being cared for so as to make them, humanely speaking, of negligible importance. So long as it is possible, however, for an irresponsible cottager to empty a privy box into the lake, as might be done, or as long as boats run on the lake, danger exists, but in so far as a surface water, not purified, may be called a drinking water, the Auburn supply may be called safe.

The analyses made of the water in general show bacterial counts very low, particularly during the summer and fall, but that during the spring the numbers may rise to an alarming extent. The colon bacillus is occasionally found in the water, especially in the spring.

It has been suggested that indirectly the city water supply becomes contaminated at some of Auburn's large factories. By requirements of the insurance companies each mill has a pump whose intake extends into the polluted waters of the outlet and which may discharge into the sprinkling system of the mill. A connection is also made between this sprinkling system and the street main. A check valve and gate are supposed to prevent the pressure of the sprinklers getting out into the street system. Once a week the fire pump is operated and the pressure in the system raised so as to exceed the city pressure. Unless the check valve is perfectly tight water may then pass from the sprinkler system into the city system, thereby polluting the comparatively pure lake water with the polluted outlet water. Tests made show beyond question that the check valves so leak and it is quite possible that the discredit attached to the city water may be due to a pollution derived as just explained.

During the summer of 1909 and after the visit of the writer to Auburn, the water commission, acting under the advice of Hazen & Whipple of New York city, have decided to install a filtration plant whereby all possibility of supplying a contaminated water to the city may be eliminated. The necessary land has been purchased and detailed plans are being prepared with the expectation of immediate construction of the plant. The natural purity of the water, supplemented by slow sand filtration, will without question provide a water supply for Auburn the quality of which will not be second to any in this country.

Summary

1. Auburn is a manufacturing city dependent for its prosperity upon its factories which are in turn dependent on the water power along the Owasco outlet. It is an old city and still maintains a character of social superiority from the prestige which old families give.

2. The proportion of inhabitants of foreign parentage is but little above the normal being 21.8 per cent., and these are housed and live in a manner not calculated to increase the death rate.

3. The general death rate in Auburn for the nine years past is 16.1, which is 2.0 lower than the average of New York State and

which may be considered a satisfactory death rate for a manufacturing city.

4. The typhoid death rate is variable, averaging 23.9 per 100,000 for the past nine years and ranging from 6.3 in 1907 to 50.0 in 1908. This is the cause of much uneasiness to the water commissioners of the city and the writer understands that they purpose to construct a filter plant to eliminate the water supply as a cause of this high and variable rate.

5. The death rate of children under five is unusually low, both when compared with the total number of deaths and when compared with the total population.

6. The milk supply is periodically investigated by the sanitary inspector, and the general standard of cleanliness on the farms is high. A more frequent determination of the bacterial count at the city laboratory could be used to check the uncleanliness of the milk.

7. The method of garbage collection is efficient and under the careful control of the health commissioner and his inspector. The disposal is on land but is carefully done, the garbage covered or ploughed under and is generally without offense.

8. The sewerage system is on the combined plan, although two districts, one under construction and one built last year, are on the separate plan. These two districts on the northwest and on the east, will discharge or are discharging into disposal plants while the rest of the city sewage goes into a disposal outlet. This is exceedingly foul, productive of offensive odors, and a public nuisance for miles down stream. The time will soon come when Auburn will be obliged to collect the sewage in an intercepting sewer and treat the sewage thus collected in a purification plant.

9. The pavements of Auburn are few in number, seven miles out of seventy miles of streets. Six miles of this are brick in admirable condition. These pavements are washed clean three times a week, and so far as these seven miles are concerned, the street surfaces are well cared for. The rest of the streets are partially improved and are in fair condition.

10. The ice supply comes from Cayuga, Ontario and Owasco lakes, all good sources of supply and furnishes an exceptionally good quality of natural ice.

11. The water supply of Auburn comes from Owasco lake, the intake being nearly half a mile from shore in water thirty-five feet deep. The drainage into this lake is carefully watched, all the houses on the watershed being inspected regularly and their drainage intercepted before reaching the lake. The drainage from the village of Moravia is the most serious pollution, and to avoid all danger from this source, as well as from irresponsible cottagers, the water company is proposing the construction of a filter plant. There can be no further suggestions made for the betterment of the water supply.

Conclusions

The writer is brought to the conclusion, after his personal visit to Auburn, after a tabulation of the mortality statistics of the city and a careful study of the same, that Auburn is more than ordinarily a healthy city and that when the water filtration plant shall have been constructed no municipal improvement on a large scale remains to be made, except in the matter of removing the nuisance from the Owasco outlet. Undoubtedly Auburn will construct for many years to come improved pavements until a more reasonable ratio of paved to unpaved streets is reached, but it is the comfort and convenience, rather than the health of the citizens, that will be served thereby. In time to come a garbage crematory will be found advisable, although the present method of caring for the garbage answers well enough. It is desirable that more frequent and comprehensive analyses of milk be made in the city laboratory in order to check the uncleanliness of the milk furnished by the different dealers.

The important municipal improvement to be undertaken in the near future is the cleaning up of the outlet and plans for this should be started at once in order that other construction works may be properly co ordinated.

Respectfully submitted,

H. H. OGDEN,

Special Assistant Engineer

BINGHAMTON

DECEMBER 1, 1909.

MR. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.*

DEAR SIR.— I beg to submit the following report covering my investigation of the sanitary condition of the city of Binghamton.

History

The city of Binghamton, at the junction of the Susquehanna and Chenango rivers, in the county of Broome, is named after William Bingham, who, in 1786, with two others, received a land patent for 30,620 acres, lying on both sides of the Susquehanna, in the vicinity of the present city. Bingham determined to establish a village on that part of the grant which fell to him individually, and the present city is all on his land. At the time, 1786, there was more prospect of the settlement being further up the Chenango, since Captain Leonard and others had already come down the Susquehanna and pushed up the Chenango and even started a small hamlet known by the same name. Mr. Bingham's agent and active manager was General John Whitney, whose active and wise interest in the development of the pioneer settlement is largely responsible for its later prosperity. In 1801 General Whitney having cleared the necessary land, built for himself a substantial dwelling near the present corner of Court and Main streets, and by removals from Chenango and by the advent of other pioneers, the little settlement, almost lost in the agricultural land and in the forests surrounding, was begun in earnest. A store was started, a hotel erected, a blacksmith shop set up, and by 1802 there was a courthouse and a jail. Between 1803 and 1813 there were many energetic men and their families, one after another, coming into the new settlement, determined to make a home and a fortune for themselves in the new country, and all uniting to promote their common good. Lawyers, doctors, carpenters and mechanics of all sorts were among the number, each doing his own work in the new settlement. In 1808 a toll bridge was built across the Chenango, later washed away and replaced by a second in 1825, to be again replaced in 1865 by a third.

In 1826 a bridge across the Susquehanna at the foot of Water street was built, replaced in 1843 by the famous old covered bridge, which lasted until recent years. In 1808 there were about 200 inhabitants and in 1840 these had increased to 2,000. A village charter was granted in 1813 to Binghamton, although the first name of the hamlet, Chenango Point, or " Chenang Pint," clung and was the postoffice name until 1830. At first communication with the outside world was partly by water along the Susquehanna and partly by turnpike, there being three of the latter. One road ran from the Hudson river at Newburgh, through Binghamton to Owego and Elmira; another ran from Binghamton northerly to Norwich, Unadilla and Utica. A third ran from Binghamton south to Montrose and other Pennsylvania points. In 1816 a mail coach ran regularly from the Hudson to Owego, one trip a week, and in 1820 three lines ran regularly.

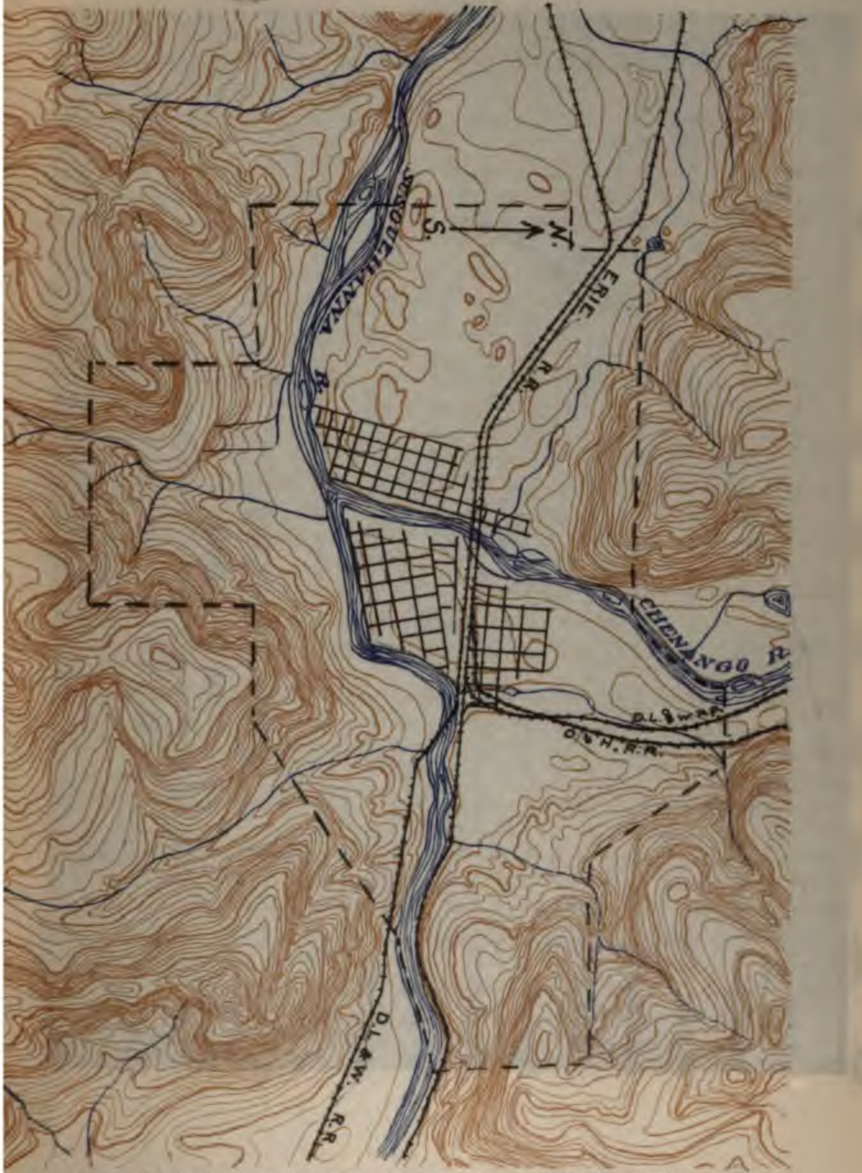
The completion of the Erie canal in 1825 aroused great interest in Binghamton and a canal was authorized by legislation in 1833 which should connect the Susquehanna at Binghamton with the Erie canal at Utica. It was finished in 1837 and for thirty-five years was of great service in developing the resources of the city and of the surrounding country. The completion of the Erie railroad to Binghamton in 1848, of the Syracuse and Binghamton railroad in 1854, of the Albany and Susquehanna in 1869, of the Utica and Susquehanna Valley in 1870, and of the Delaware, Lackawanna & Western railroad in 1870, with the more recent extension of the latter to Buffalo, gave and have given unequalled transportation facilities, which have done much to make Binghamton what it is to-day, the largest city of the southern tier.

Originally a lumber center, vast quantities of dressed and rough lumber were shipped from Binghamton in the middle of the last century. As late as 1880 rafts were still sent down the Susquehanna, but since 1850 the city has become more and more an agricultural and manufacturing center, the proximity to the coal fields and the splendid railroad facilities aiding the manufacturing development of the latter. To-day Binghamton is a thriving, progressive city, with an active Chamber of Commerce, with all needed municipal improvements and with every indication of unlimited future growth. The diagram shows the change in population since 1810.

Topography

Binghamton is situated on a peninsula of land between the Susquehanna and Chenango rivers as shown on the accompanying map. The city has outgrown the restricted area, however, and has extended across both rivers to the south and west. The elevation of the city is about 850 feet above tide water, while the hills to the north and south of the Susquehanna rise to about 1,600 feet. The northern part of the city is flat and drainage is difficult, and in the past much trouble has been experienced in carrying off storm water; sewers, though adequate when built, have proved too small after their drainage area became built up. West of the Chenango a decided ridge runs along parallel to the Susquehanna, which has proven an obstacle to the drainage of the areas south of the railroads, but a large sewer recently cut through the ridge will eliminate this difficulty in the future.

Several small streams run across the city and discharge into one of the rivers. Trout brook flows easterly into the Chenango, running parallel to the railroads and draining a large part of the city west of the Chenango. Brandywine creek runs southerly into the Susquehanna, draining the eastern part of the city. Three streams flow northerly into the same river, the middle one passing through built-up territory while the others are as yet in the open country. The Erie and Delaware, Lackawanna & Western railroads have Binghamton as a division point and make it a stop for all trains on their trunk lines from New York to Buffalo. It is also the junction point for the Syracuse and Utica branches of the latter road. It is also a terminus of that branch of the Delaware & Hudson leading to Albany. As yet there is no road south, though charters have been granted and even construction commenced on several occasions, the direct transportation of Pennsylvania coal being the object of such road. The rivers have ceased to be of value for traffic. A dam across the Chenango at



Map of Binghamton Showing Topography and Railroad Connections.

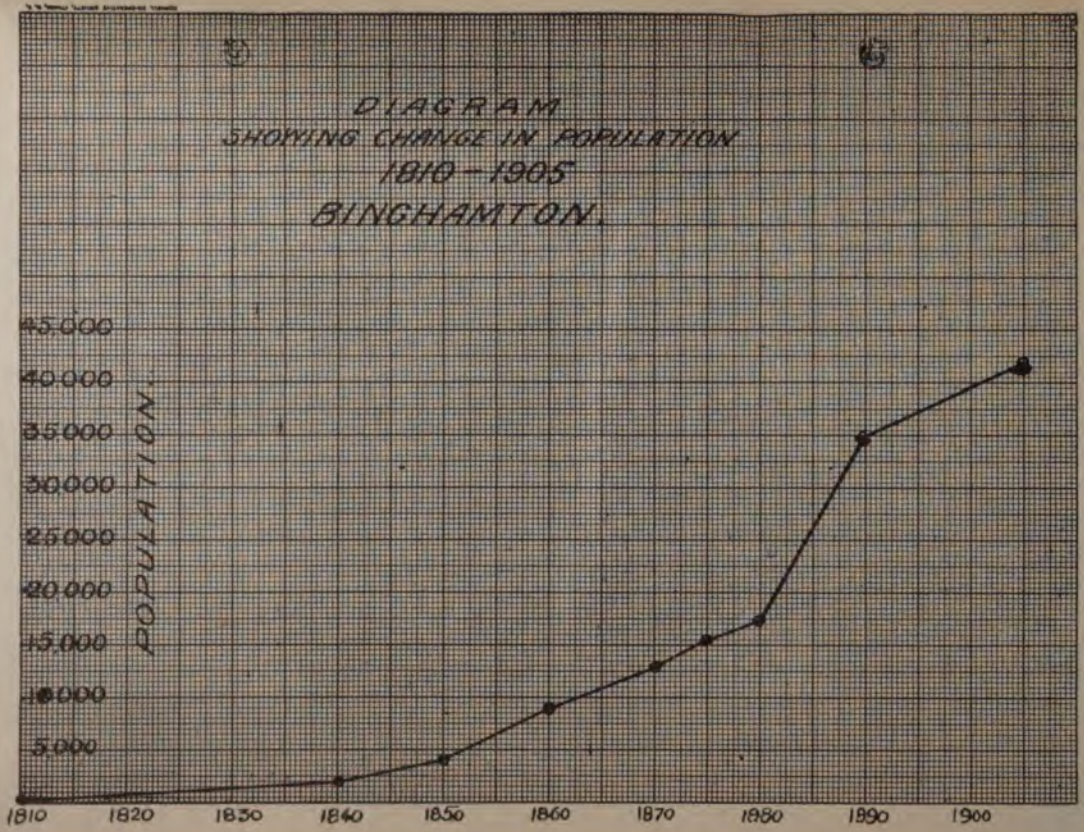


DIAGRAM
SHOWING CHANGE IN POPULATION
1810 – 1905
BINGHAMTON.
POPULATION.
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
1810
1820
1830
1840
1850
1860
1870
1880
1890
1900

the edge of the city gives a small amount of power, and the State dam on the other river forms a basin extending back about two miles. Below both dams, in low water, there is a succession of rifts and shallows, rendering it almost impossible to float a canoe.

Industries

Binghamton has always been a manufacturing city. Dams were built across both rivers, and sawmills, gristmills and tanneries were the first factories. Then followed plaster mills, a carding-mill, a sled and carriage factory, most of them grouped around the Susquehanna, making a suburb called Millville. In 1860 a large tannery, Binghamton's largest factory, was started and ran successfully until 1900, when it was absorbed by the trust. In 1850 a practical cigarmaker started his trade in the city and, gradually attracting others, the business grew rapidly. In 1870 moulds for making cigars mechanically were introduced and for twenty years a remarkable growth in this line followed, making Binghamton the second city in the United States in the manufacture of cigars, employing 5,000 operatives in 100 factories. A long and bitterly-contested strike in 1900 arrested this growth and, while still an important business, cigar-making is now less extensive than ten years ago.

The making of scales is another interest for which Binghamton is famous. The fact that Jones of Binghamton pays the freight is known the world over and has awakened an interest in the scales that Jones makes. There is also the plant of the Binghamton Scale Works, which has a large establishment.

In 1900 Binghamton was ninth in rank in the State, both by population and by manufacture, Utica being eighth in rank and Cohoes tenth. According to the census of 1900, the leading manufacturing industries in Binghamton were: Tobacco, cigars and cigarettes; flouring and grist-mill products; men's clothing; patent medicines and compounds; lumber, planing-mill products; furniture, factory product.

The following table shows for 1900 and 1905, with the percentage of increase, the statistics of manufacturing establishments in Binghamton as compiled by the Department of Commerce and

Labor of the United States for 1905, account being taken of the large and important manufacturing establishments only:

	Number of Establishments	Capital	Wage earners	Value of products
1900	219	$8, 654, 384	5, 011	$10, 539, 242
1905	241	11, 826, 977	5, 636	13, 907, 403
Increase	10.0	36.7	12.5	32.0

In 1905 Binghamton ranked 12th, Niagara Falls 10th, Amsterdam 11th, Auburn 13th, and Jamestown 14th.

By the United States census reports on manufacturing for 1900, differing in scope and detail from the report above referred to, there were in Binghamton in 1890, 704 establishments; in 1900 only 594. During this period, however, the capital employed in Binghamton increased from $9,058,651 to $9,295,859, while the value of products decreased from $15,040,152 to $12,638,547. At the same time the number of employees decreased from 9,178, earning $3,507,184, to 6,106, earning $2,461,084. This increase in capital and decrease in establishments, employees and value of products is rather curious, and is an evidence of the tendency to concentration, so marked in recent times. It also leads to the conclusion that one or more of the business interests suffered irreparable loss during this period, and upon inquiry in the city the writer found this to have been true. The setback was due partly to the panic of 1893 and partly to the cigarmakers' strike in 1900.

The following table shows the comparative standing of Binghamton with other cities of the State of about the same size:

COMPARATIVE TABLE OF MANUFACTURERS IN 1900

City	Population	Establishments	Wage earners	Value of products
Utica	56, 383	733	10, 759	$19, 550, 850
Yonkers	47, 931	387	8, 615	19, 580, 324
Binghamton	39, 647	594	6, 106	12, 638, 547
Elmira	35, 672	362	4, 914	8, 558, 786
Schenectady	31, 682	388	4, 431	9, 288, 387

This table shows Binghamton to be of average manufacturing importance, the number of establishments, however, notwithstanding the reduction since 1890, being above the average. This would indicate that there are still in Binghamton a large number of small dealers who have not yet consolidated their interests.

The following table gives the total population, the number of women and children employed and the ratio of the latter to the former, according to the 1900 census report:

TABLE SHOWING THE PERCENTAGE OF WOMEN AND CHILDREN EMPLOYED IN BINGHAMTON AND OTHER CITIES IN THE UNITED STATES

City	Women and children employed	Population	Ratio
Utica	3,051	56,383	5.4
Yonkers	3,885	47,931	8.1
Binghamton	2,136	39,647	5.4
Elmira	1,410	35,672	3.9
Schenectady	652	31,682	0.2
United States	1,200,192	75,994,575	1.58

The above table indicates that the ratio of women and children employed in Binghamton is above the average, and this should have the effect of raising the death rate.

The following table shows various data concerning the different manufacturing establishments, according to the special census report of 1905. It is to be noted that out of 5,636 wage-earners 40 per cent. of them are women. It is also worth noting that out of the 42,000 population, only 5,636 are wage-earners, a small ratio, when the number of women employed is considered. By far the largest number in any one establishment are at work in the cigar factories, about one-third of the total number, and of the 2,334 women wage-earners 1,400 are in these factories. Such employment fortunately is not injurious to health, except insofar as it may affect the lungs and the nervous system, and it will be of interest to note the amount of tuberculosis in Binghamton as compared with other cities. Otherwise it is not apparent that the occupations of residents of Binghamton influence their health either by reducing vitality or increasing the death rate.

	Est.	Capital	Wage earners	Men +16	Women +16	Ch. —16	Value prod.
Bookbinders	3	$8, 450	8	2	6	..	$8, 400
Bread, etc.	11	167, 072	117	102	15	..	362, 542
Carriages and wagons......	8	307, 717	201	194	7	..	333, 889
Clothing, men's	8	773, 921	448	93	355	..	833, 835
Confectionery	4	41, 500	39	8	30	1	72, 500
Copper and sheet iron......	3	12, 761	10	10	......	..	41, 784
Flavoring extracts	6	81, 434	32	18	14	..	153, 911
Flour and grist mill.......	5	300, 225	35	34	1	..	1, 089, 910
Foundry and machine shop..	11	669, 786	219	213	6	..	526, 040
Furniture	4	484, 151	359	347	10	2	587, 374
Gloves and mittens.........	3	15, 185	28	11	17	..	51, 840
Liquors, malt	3	246, 144	22	22	......	..	160, 060
Lumber and planing mills..	4	587, 791	247	244	.....	3	621, 940
Mineral and soda..........	4	38, 310	8	8	......	..	19, 468
Patent medicine	12	1, 211, 536	112	45	67	..	2, 133, 198
Photo. materials	3	101, 033	25	16	9	..	150, 400
Print. and Pub., book and job	15	150, 610	59	55	3	1	122, 448
Print. & Pub., news and per.	6	479, 931	121	121	......	..	279, 285
Shirts	3	12, 053	23	1	22	..	38, 000
Tobacco, chw., smk., snuff..	3	6, 355	18	4	14	..	11, 408
Tobacco, cigars & cigarettes.	58	2, 221, 939	1, 991	580	1, 400	11	2, 867, 809
Other industries	64	3, 909, 073	1, 514	1, 148	358	8	3, 441, 362
Totals	241	$11, 826, 977	5, 636	3, 276	2, 334	26	$13, 907, 403

Sociology

There is little of peculiar interest in the social conditions existing in Binghamton. There are no markedly congested districts, no accumulation of tenements, and the population is well scattered, and housed chiefly in separate buildings, each with its own yard.

The 1900 population of 39,647 was housed in 7,018 dwellings, or 5.6 persons per dwelling, somewhat above the average of the United States, which is 5.3 persons per dwelling, but much less than for Schenectady or Yonkers, which have 7.0 and 8.9 persons respectively.

The following table shows comparative figures for Binghamton and other cities of the same size in the State:

	Population	No. dwellings	Persons per dwelling
Utica	56, 383	9, 118	6.2
Yonkers	47, 931	5, 349	8.9
Binghamton	39, 647	7, 018	5.6
Elmira	35, 672	7, 237	4.9
Schenectady	31, 682	4, 511	7.0
Auburn	30, 345	5, 709	5.3
United States	76, 303, 387	14, 430, 145	5.3

The number of persons per family in Binghamton together with corresponding data for these same cities is shown in the following table:

TABLE SHOWING NUMBER IN FAMILY IN SOME CITIES OF NEW YORK STATE AND IN THE UNITED STATES

	Population	Families	No. in family
Utica	56,383	12,268	4.6
Yonkers	47,931	9,629	4.9
Binghamton	39,647	9,440	4.2
Elmira	35,672	8,231	4.3
Schenectady	31,682	6,722	4.7
Auburn	30,345	6,813	4.4
United States	76,303,387	16,239,797	4.7

This indicates that Binghamton has fewer than the normal number of children in the family, both compared with the United States as a whole and with other cities of the State. If the number per family were increased from 4.2 to 4.7 it would add nearly 5,000 persons more to the families, presumably children, thereby increasing the death rate. To corroborate this fact it may be noted that of the 39,647 population only 4,272, or 11 per cent., were foreign born. Of these the proportion coming from Italy, Poland, Hungary, Russia, where the birth rate is high, is very small, only 330, too small to balance the gradually declining birth rate among American stock. The State health report for 1908 gives Binghamton a birth rate of 20.1, whereas the average rate for all the cities in the State is 26.7. Dunkirk, with its large foreign population, has a birth rate of 36.6.

The 1900 census reports for Binghamton 2,931 children under five years of age, or 7.4 per cent., while in the United States as a whole this ratio is 12.1, nearly double that of Binghamton, or, Binghamton normally should have 4,800 children, or 1,909 more than at present. This condition is probably partly due to the large number of women working in factories, but is chiefly of interest as discrediting the death rate.

Mortality Statistics

The general death rate of Binghamton is apparently normal, and the following table gives the rate by years since 1900:

TABLE SHOWING GENERAL DEATH RATES IN BINGHAMTON PER 1,000 POPULATION FOR 1901–1908, INC.

Year	Population	Deaths	Rate Per 1,000
1900	39,647	822	20.7
1901	40,125	755	18.8
1902	40,603	725	17.8
1903	41,081	619	15.0
1904	41,559	762	18.3
1905	42,036	678	16.1
1906	42,514	655	15.4
1907	42,992	673	15.7
1908	43,470	751	17.3

Average = 17.2.

For purposes of comparison, the following table gives death rates for other cities of the United States whose population is about 40,000 for the five year periods 1903–1907:

	1903	1904	1905	1906	1907
Mobile, Ala.	23.1	25.4	25.2	26.0	24.4
Jacksonville, Fla.	27.0	26.6	28.7	25.0	28.0
Quincy, Ill.	14.7	15.4	14.7	12.9	15.2
Springfield, Ill.	16.5	21.4	16.8	19.3	21.0
Fort Wayne, Ind.	15.5	13.9	13.7	15.0	15.3
South Bend, Ind.	12.0	13.9	15.2	14.4	14.0
Brockton, Mass.	11.2	12.4	13.0	11.9	13.3
Malden, Mass.	14.3	13.2	13.3	13.8	13.7
Salem, Mass.	20.1	18.9	19.7	20.1	18.7
Bay City, Mich.	13.8	14.1	12.6	14.2	16.8
Passaic, N. J.	19.2	18.4	18.2	17.3	19.4
Elmira, N. Y.	14.7	15.5	15.5	14.5	15.9
McKeesport, Pa.	17.6	18.4	18.2	19.9	19.7
Pawtucket, R. I.	15.9	16.0	16.7	16.2	18.7
Wheeling, W. Va.	15.6	17.5	15.3	16.4	19.7
	251.2	261.0	256.8	256.9	273.8

Average = 17.3

The average is 17.3, agreeing closely with Binghamton at 17.2. If a correction should be made for the number of children in which Binghamton is below the normal the death rate in Binghamton would be increased to 22.0.

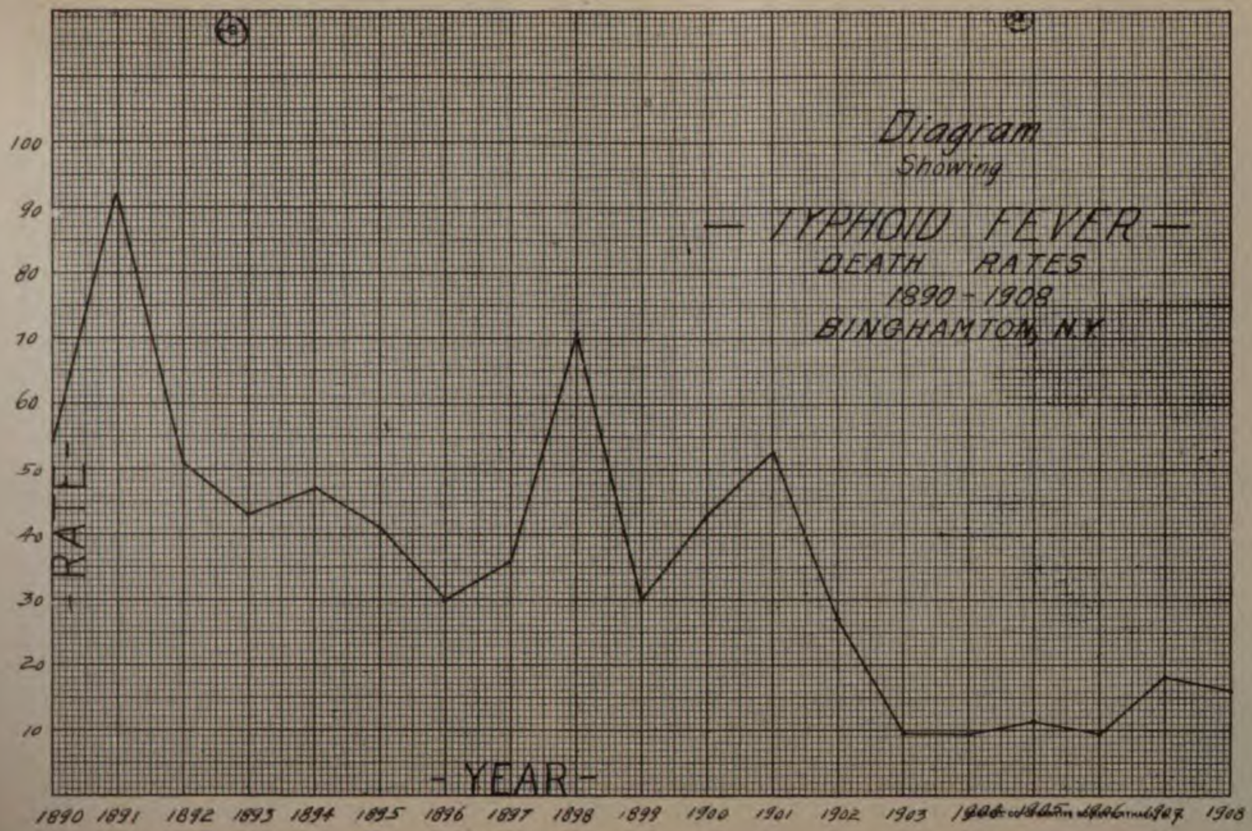


Diagram
Showing
— TYPHOID FEVER —
DEATH RATES
1890 - 1908
BINGHAMTON, N.Y.
- RATE -
- YEAR -
100
90
80
70
60
50
40
30
20
10
1890
1891
1892
1893
1894
1895
1896
1897
1898
1899
1900
1901
1902
1903
1904
1905
1906
1907
1908

The apparently normal rate, therefore, is not satisfactory and should be studied to ascertain if possible how it may be further reduced. In one of the reports of the local department of health it was suggested that since the city was the favorite residence for people in their declining years, the population must have an undue proportion of elderly people among whom the death rate is high, and as a proof it was pointed out that in one year out of 701 deaths in the city proper 230, or 32.8 per cent. were over 60 years of age. But for the five-year period 1903–1907 in New York State out of 146,882 deaths 44,346 or 30.2 per cent were over 60, a ratio not differing materially from Binghamton. On the other hand, for 1907 the ratio in Auburn of deaths over 60 to total deaths was 37.7 and for Geneva 43.4. The death rate in Geneva with this high rate of deaths over 60 is 14.6 as an average for nine years. So that Binghamton can hardly claim consideration for its rate of 17.2 because of its number of elderly citizens.

Turning to the death rates from typhoid fever, the following table shows this rate per 100,000 population since 1900, and the same data with additional data since 1890 are shown graphically in the diagram:

TYPHOID FEVER DEATH RATES IN BINGHAMTON FOR THE PERIOD 1900–1908

Year	Population	Deaths	Rate per 100,000 pop.
1900	39,647	17	42.9
1901	40,125	21	52.5
1902	40,603	11	27.1
1903	41,081	4	9.7
1904	41,559	4	9.6
1905	42,036	5	11.9
1906	42,514	4	9.4
1907	42,992	8	18.6
1908	43,470	7	16.1

Average = 21.9

The sharp and persistent lowering of the death rate since 1902 is due to the installation of a filter plant for the water supply, to be further discussed under "Water." The following table from the latest figures available (U. S. Report of Census Office on Mortality Statistics for 1907, p. 35) gives the corresponding ratios for various other countries:

TABLE SHOWING NUMBER OF DEATHS FROM TYPHOID FEVER PER 100,000 POPULATION IN VARIOUS LOCALITIES

	Annual Average				
	1901–5	1903	1904	1905	1906
United States	32.2	34.3	31.9	28.1	32.1
Australasia	19.0	25.5	15.5	13.7	15.7
Austria	19.9	19.7	19.3		
German Empire	7.6	7.3	7.0	6.3	
Italy	35.2	35.5	36.9	32.7	28.1
Japan	11.6	9.8	10.8	13.2	
Sweden	8.3	5.3	5.1		
Switzerland	6.2	5.0	7.7	5.0	
United Kingdom	11.5	10.3	9.4	9.1	

Compared, therefore, with the United States or with New York State, Binghamton may fairly be congratulated on the improvement and on its present rate. Compared with other countries, however, there is still a large amount of typhoid fever in the city, and the authorities should not relax their efforts to maintain a rate of 10 or less per 100,000.

Another method of checking the hygienic conditions of a city is by computing the death rates of children under five years of age, since young children are easily susceptible to disorders of the digestive system. The following table gives these data for the nine years 1900–1908, inclusive:

TABLE SHOWING THE DEATH RATES FOR CHILDREN UNDER FIVE IN BINGHAMTON FOR THE PERIOD 1900–1908, INCLUSIVE

Year	Population	Deaths	Rate per 10,000
1900	39,647	144	36.3
1901	40.125	136	34.0
1902	40,603	127	31.2
1903	41.081	94	22.9
1904	41,559	131	31.5
1905	42.036	128	30.4
1906	42,514	156	36.6
1907	42.092	154	35.8
1908	43,470	199	46.0

Average = 33.8

For comparison the following table is given, data being taken from U. S. Census Office Report of Mortality Statistics for 1907:

	Population	Deaths under five	Rate per 10,000
Registration area	41.758.037	183.774	44.0
Registration states	33.516.714	147.507	41.5
Massachusetts	3.083.013	14,620	47.4
New York	8,386,673	39,773	47.4
Pennsylvania	7.032,915	36,433	51.8
Binghamton average for 9 years			33.8

This shows Binghamton to have a surprisingly low rate of deaths among children, indicating either unusually healthful surroundings as affecting children or else a number of children fewer than the normal to be affected. From the statements made on page 705 the latter is probably the case, and if a correction should be made, the deaths would probably be over fifty instead of 33.8, as at present. It should also be noted that in 1908, even under the favorable conditions, the rate reached 46.0, about the same as places with the normal number of children.

Again comparing the deaths under five with total deaths, the same departure from the normal is apparent.

Table Showing the Ratio of Deaths Under Five to Total Deaths for Binghamton for the Years 1900–8 Inclusive

Year	No. deaths	Under five	Ratio
1900	822	144	17.5
1901	755	136	18.1
1902	725	127	17.6
1903	619	94	15.2
1904	762	131	17.2
1905	678	128	18.9
1906	655	156	23.8
1907	673	154	22.9
1908	751	199	26.5

Average = 19.7

For comparison the following table gives similar data for 1907, taken from the U. S. Census Office Reports of Mortality Statistics:

	Total deaths	Deaths under five	Ratio
The registration area	687,034	183,774	26.7
Registration states	550,245	147,507	26.8
Registration cities	464,673	131,159	28.2
Massachusetts	53,870	14,620	27.1
New York	146,882	39,773	27.1
Pennsylvania	111,969	36,433	31.4

The contrast between the ratio for Binghamton, 19.7, and the normal rate, apparently about 27, is most striking and emphasizes again the misapprehension to be obtained from the general death rate alone. Here again the lack of children, not their superior healthfulness, is probably responsible for the small ratio.

No evidence is to be found in statistical data to show that tuberculosis, or any other lung troubles are in excess. Diseases of the nervous system are high, 223.1 per 100,000 population, an excess of 82 per 100,000, or about forty deaths annually in Binghamton from diseases of the nervous system in excess of the normal. Such diseases are apoplexy, paralysis, meningitis and convulsions, and this is the most glaring excess of deaths from any one class of diseases in Binghamton. The reason for this excess the writer cannot now undertake to state. In a recent treatise on Disease of Occupation (E. P. Dutton, 1908) it is claimed by the author that nowhere has he witnessed anything to lead him to regard work in tobacco factories as an occupation dangerous to health.

Milk Supply

The proper supervision of the milk supply of Binghamton is of recent date. The sanitary code of the city, adopted January 2, 1907, merely specifies that milk, along with meat, fish, fruit and vegetables, shall be fresh, sound, wholesome and safe for use, and only on February 26, 1909, were regulations regarding the production and marketing of milk enacted by the commissioner of health. These rules are peculiar in some ways from those ordinarily in effect in other cities of the State. All milk must be able to be classified under one of the following heads:

1. Certified milk.
2. Inspected milk.
3. Pasteurized milk.
4. Ordinary milk.

These classes are defined as follows:

(1) *Certified Milk.*—" This milk must be produced from tuberculin tested cattle in accordance with the rules prescribed by the milk committee of the Broome County Medical Society."

(2) *Inspected Milk.*— " This milk must be produced and marketed with special care as regards cleanliness, from cattle free from apparent disease and must contain no foreign matter, and must show on delivery to the consumer not more than 50,000 bacteria per cubic centimeter."

(3) *Pasteurized Milk.*— " This milk must have undergone the process of pasteurization, and must otherwise conform to the standard herein fixed for " Ordinary Milk " as to cleanliness and bacterial count, upon delivery to the consumer."

(4) *Ordinary Milk.*—"This must be produced in a fairly cleanly manner from cattle free from known disease, and must contain no sediment, and show, on delivery to the consumer, not more than 300,000 bacteria per cubic centimeter."

No authorization or regulation apparently is necessary for certified milk, except a tuberculin test, which exempts such cattle from all other oversight. The inspected milk class must depend, since it is measured only by bacterial count, on a regular and frequent determination of the bacterial count. In the same way, unless shut out by an excess of bacteria, any milk may be sold in the city. No registration of dealers or farms is required, and it would seem impossible to make a competent inspection of milk supplied to a city, without any record of dealers or producers. From January 1, 1909, when the law went into effect, to July 1st, the inspector has taken samples from 104 milk wagons, as encountered on the streets, according to the reports of the chemist, and from 231 wagons as reported in his monthly statement to the Commissioner. It is impossible to say whether this covers all the dealers or not, but it certainly does not include all the farms from which milk is obtained. At Auburn, with its smaller population, 695 farms are recorded as furnishing milk to the city, all of which are regularly inspected and their condition reported. Where their sanitary condition is not good, the farm is excluded from supplying milk to the city unless the improvements recommended are made.

There are a number of dealers in Binghamton who furnish a supply of milk of exceptionally good quality, three firms, for example, being able to show a count of less than 50,000 at every examination. A number of others have shown a similarly low count on the one occasion of a test. On the other hand, a number of single tests have been decidedly above the number 300,000 prescribed for ordinary milk, and the writer could not learn that such dealers had been forbidden to distribute more milk. The writer would conclude that, to maintain any control over the milk supply, securing a reasonably clean milk, that all dealers should be required to be licensed, their application giving, under oath, the farms from which the milk they distribute is obtained; that the sampling and testing of milk should be more frequent and thorough, so as to include at least one sample from every farm as often as once a month; and that samples showing more bacteria than the number allowed by the Commissioner of Health should be at once considered good reason to forbid the dealer concerned to distribute milk for a definite period, and not after that period unless the bacterial count is satisfactory. During the first six months of 1909 the inspector reported eighty-nine farms visited, some doubtless more than once. The suggestions to milk dealers published by the Health Commission and intended to guide the producers in obtaining a milk with a low count, are admirable, except perhaps in the details of what should be done. For example, Rule 3 says " stables should be well ventilated and light," but no information is vouchsafed as to what amount of ventilation and of window area is considered satisfactory. Rule 21 says that the milk should be cooled after straining, but no temperature is suggested. If the requirement of a low bacterial count was strictly adhered to the proper care of the milk would necessarily follow, but without enforcement of the regulations of caring for the milk, and without strict enforcement of a low bacterial content in the milk distributed, no practical regulation of the milk supply is practiced.

Garbage

The garbage collection and disposal question at Binghamton has not yet been solved, in fact, no attempt at a solution has been made. No municipal organization exists, and in the city of 45,000 people each householder is obliged to make private arrangements with some farmer to call and carry away the garbage. The city maintains a dump in the vicinity of Front and Gaines streets, to which any citizen may bring garbage, the city maintaining three men on the dump who so dispose of the wastes as to avoid odors. A one-horse cart is continually used to haul gravel from a nearby bank for covering. Another dump of large size lies along the north bank of the Susquehanna near Butternut street, where the rear end of the lots have been filled in, twenty feet deep in some places. On the south side of the river, large amounts of garbage have been tipped over the bank and the " Point " is a mecca for those who have rubbish of any sort to get rid of. The result of this failure of the city to provide garbage collection facilities is naturally for every one to carry refuse to the nearest river bank and throw it over. This custom has grown to be so general that its objectionable features have been apparent, and, without providing any substitute or alternative, the city council, in March of this year, passed an ordinance prohibiting the throwing, depositing, or placing of any ashes, offal, dirt, refuse or garbage upon the banks, of any stream within the city of Binghamton under penalty of a fine of $10. It was further ordained that carts for transporting swill, garbage, or other offensive substance shall have watertight boxes under penalty of a fine of $5. The board of health in section 20 prohibits dumping garbage in any other place than that which is or which may be designated by the Board as a public dumping ground and forbids any owner of lands to knowingly permit garbage to be deposited on his lands. Section 22 required that a garbage can be provided for each house tenement, apartment, or flat, and that the owner or occupant shall cause the can to be emptied at least once a week during the summer. Except for these provisions, the individual must be his own garbage collector and may dispose of the same in any way he chooses. It seems to the writer that for the convenience of the householders, for the improvement of the conditions on the river banks, and for the gain in healthful conditions by regular service in collection, the city ought to at once assume the duties in the matter of garbage collection so generally recognized as an essential part of municipal administration.

Sewerage

The construction of sewers in Binghamton began in 1880 under designs of Rudolph Hering, and since that time additions have been made from year to year as the growth of the city required. The system was designed on the combined plan, and was generally arranged to discharge the sewage into either river at the nearest point. In some places the growth of the city has resulted in an overtaxing of the system, and there is now a proposition to construct a 48-inch sewer alongside a 24-inch pipe which latter was, when constructed, supposed to have ample capacity. In 1907 in connection with the approval of plans for the fourth ward trunk sewer, the great need of a separation of sanitary sewage from storm or surface water was pointed out to the city authorities in the development of new sewerage districts and also as far as possible, in the present sewered areas. In fact, such a requirement was made a condition of the permit issued in the case of lateral sewers in the fourth ward sewer district. Since that time, the principle of designing sewers on the separate plan has been carried out by the city in general accordance with this policy. In studying the present sewers, one cannot but be impressed with the need of a careful revision of the whole system. Some sewers are much too large and some are overtaxed and flooded by every heavy rain. A number of overflow pipes have been laid by which one line of sewers is connected with another, relieving the first at the expense of the second.

Dr. Hix, health officer in 1907, voices the opinion of the writer exactly when he writes: "A survey of the city should be made for the purpose of making a complete sewer plan before any more sewers are built." The question of disposal is also a matter which demands immediate attention. In granting a permit for the construction of the so-called fourth ward sewer, March 29, 1907, the State Commissioner of Health set forth the requirement that by April 1, 1910, plans for a complete system of intercepting sanitary sewers and sewage treatment works for the collection and treatment of the sewage of the entire city, shall be submitted by the city to the State Commissioner of Health for approval. That such intercepting sewers are necessary is shown by the Chief Engineer of the Department in his report on the fourth ward sewer (28th An. Rept., Vol. II, page 21), in which he shows that the low water flow of the rivers is not sufficient to properly dilute the present sewage flow, and that local nuisances will be inevitable in the near future. Indeed, the writer has plainly detected the characteristic sewage odors along the Chenango, arising from the large proportion of sewers in the river.

Professor Landreth sums up his impressions of the pollution of the rivers in 1900 as follows: (21st Annual Report, Page 195.)

" * * * Both banks of the Chenango river from the Erie railroad bridge down to the Susquehanna, and the north bank of the Susquehanna are strewn with sewage, garbage and other refuse, including the stable manure from one of the city's fire engine houses. For this whole river frontage the water surface near the shore is covered with a slimy mass of aquatic vegetation entraining floating sewage and garbage, and the shallow water near the banks is filled with various other forms of aquatic growth which thrive only in polluted waters. Above the uppermost sewer the waters of the Chenango are clear, and the banks clean and gravelly, and the river here forms an attractive feature, a condition which might prevail throughout the whole river frontage if the polluting material could be kept from this part of the river. In addition to the disgusting appearance of the river banks the odors frequently cause annoyance to adjoining residents, and the decaying vegetation and floating putrescible matter along the banks produce just the conditions favorable to malaria, concerning the present occurrence of which there was some disagreement among the physicians and residents of the locality."

One of the interesting factors in the sewerage question at Binghamton is the amount of sewage which comes from the State hospital, just outside the city, to the east. Formerly, the sewage from the hospital with 2,000 residents, was discharged directly into the river, but the fact that the city water supply was taken from the river in the immediate vicinity made this seem inadvisable, so in 1892, the Legislature appropriated $50,000 to pay one-half the cost of a new outlet sewer from the hospital through the city to the Chenango. This sewer is used by the city and the act of Legislature places the burden of its care and maintenance on the city. In taking up the question of treating the city sewage, the local authorities point to this State sewer as being the most grievous source of pollution and intimate that the initiative in improvement should come from the State and that a generous contribution toward the cost should be paid by it. In 1900 Mr. O. H. Landreth summed up the elements of this question as follows, intimating that in his opinion the State should bear its proper proportion of the cost, without stating what this proportion should be:

" The proper determination of the just proportion of expense to be assessed by the city and the state respectively involves the study of a number of elements, such as: the relative populations in the city and at the asylum provided for; the relative cost of the extension proper, and of the intercepting sewers entering it; the fact that the law of 1891 imposed the burden of the care and maintenance of the sewer in the city, relieving the state from any portion of such burden; the fact that the sewage from the asylum is and doubtless will continue to be heavily charged with antiseptics which will render the artificial treatment of such sewage by future disposal works a matter of difficulty and expense."

" These elements would require more time for their proper determination than it is desirable should be given before a report on the main matter is submitted."

The discharge of the sewage is generally through iron pipes extending well out into the river and it may be said that so far as details of construction can help matters, the present outfalls are placed as advantageously as possible. The advantage of the State requirement that sewers should be henceforth built on the separate plan is well summarized by the Chief Engineer as follows:

" If, as is evident, sewage disposal is to be ultimately required for the sewage of the entire city, it is highly desirable, if not necessary, to keep the sewage separate from the water that collects during storms or as a natural drainage from the land whenever this is possible. If this separation is to be secured in the future in the Fourth ward, it is necessary that all lateral sewers, which may be constructed now or in the future, to receive domestic sewage, whether or not they be allowed to discharge temporarily into the proposed trunk sewer should be sanitary sewers. They should be designed with sizes and grades that will admit of their being intercepted by a sanitary trunk sewer to be provided in the future, and to be led to disposal plant located at some favorable point below the city. Such a sanitary trunk sewer would then only have to be of moderate size compared with the present storm outfall sewer. Its route would more naturally be along the route of natural drainage for this section, i. e., to the westward. When the time comes for its construction, it could also provide for any additional territory, west of the present city line, that may be added to the city in the future."

The diagram appended shows the location of sewers and indicates the general distribution of the same. The area south of the Susquehanna apparently laid out in streets without sewers is really farm land. The extreme western part of the city shown without sewers is built up and sewers are now planned for this district. The northeastern part of the city is also growing rapidly and will need sewers. As the map shows there are eight outfalls into the

Susquehanna river, and seven into the Chenango, most of them built with the main outlet on the river bank, and with a small iron pipe extending about thirty feet into the river. The total length of sewers is shown in the following table, amounting to 48.10 miles of sewers in 91.63 miles of accepted streets, or about one-half of the streets have sewers:

SEWERS — PIPE

	Feet
6 inches	2,370
8 inches	75,799
10 inches	29,235
12 inches	34,221
15 inches	30,221
18 inches	17,997
20 inches	5,012
24 inches	1,930
27 inches	1,076

SEWERS — BRICK

15 by 22½ inches	668
18 by 27 inches	3,541
19¼ by 29 inches	32
20 by 30 inches	5,956
21½ by 37¼ inches	350
22 by 33 inches	4,477
24 by 36 inches	6,788
25 by 37½ inches	419
25½ by 34 inches	500
26 by 39 inches	1,522
28 by 42 inches	5,220
28½ by 42½ inches	692
30 by 45 inches	1,922
34 by 39 inches	597
34 by 42 inches	1,943
36 by 42 inches	1,926
32 by 48 inches	685
34 by 51 inches	1,830

	Feet
35 by 40 inches	306
36 by 48 inches	1,287
4 feet by 4 feet	2,189
4.29 by 2.86 feet	1,260
4.59 by 3.05 feet	1,762
4.90 by 3.27 feet	886
40 by 60 inches	1,524
4 feet 6 inches, circumference	1,203
4 feet 3 inches by 6 feet 4½ inches	1,013
4 by 6 feet	1,677
3 feet 9 inches by 5 feet 7½ inches	1,209

REINFORCED CONCRETE SEWERS

36 inches	422
42 inches	539
4 feet 6 inches by 5 feet 6 inches	522

Since only about one-fifth of the streets are paved a large amount of sand, gravel, etc., is washed from the streets into the sewers and the catch-basins are usually filled after every storm. Two crews, consisting of a foreman, team and two laborers, are constantly employed cleaning these basins, but evidently each basin is cleaned only at very infrequent intervals.

Pavements

Binghamton is markedly deficient in the amount of street paving, the city engineer at the close of 1909 reporting 12.6 miles of brick and asphalt streets and five miles of macadam streets out of a total of 91.63 miles of accepted streets. One reason for this small length of pavement is that the asphalt streets built in years gone by have proved unsatisfactory and have been rebuilt, so that the streets now paved do not represent the amount of paving actually done. Nineteen per cent. of the streets paved is, however, in marked contrast with Geneva, for example, which has 48 per cent. paved. The brick streets have been only recently paved and are in good condition, but the asphalt streets are full of holes, in which street dirt accumulates and in dry weather is blown about to the great discomfort of pedestrians. Recently the street commissioner has filled these holes with broken stone and gravel, merely to make the streets passable until repaving can be accomplished. The diagram appended shows the location of the various pavements and shows graphically the small proportion of the total mileage. In the matter of street cleaning the city is taking proper care of its streets, two-horse sweepers being constantly employed in going over the pavements, some daily and none less often than three times a week. To take care of the seventy-four miles of streets which are not paved the city has three gangs of men constantly employed grading and ditching, cleaning gutters and culverts, and rounding up the surfaces of the dirt roads. Two wagons are employed to collect the street sweepings from the paved streets, the collections being dumped at the "point" and into the old canal prism on the south side. An idea of the relative amounts of work expended on paved and unpaved streets may be gained from the payrolls for 1909 which show $9,665.60 expended on paved streets and $18,263.54 expended for grading and ditching the unpaved streets. In the matter of sprinkling the city assumes no responsibility, the work being done by private arrangement with the householders. The city has one sprinkler, used in connection with the street sweepers. Altogether it may properly be said that the city has yet to do a large amount of paving before the streets of the city can be of the greatest service to the residents, and to bring the street area into the cleanly condition possible only with pavements. It is probable that the streets built in the future will be of more permanent construction than in the past and that from now on a steady advance in pavements will be apparent.

Ice

Practically all the ice of the city comes from the Binghamton Cold Storage and Ice Co., or from the Cutler Ice Co. The former ice company, besides operating their large cold storage plant, have a plant for making artificial or hygeia ice. Up to the present time their daily capacity has been about eighteen tons, but by improvements recently made this is now increased to thirty tons. This concern does not distribute but sells ice at the plant to dealers. There are a number of these dealers who run one or two wagons, all the output of the ice company being taken. At the time of the writer's visit, there was but little ice on hand, practically all that was made being taken away at once. The water of which the ice is made comes from two deep wells, and is then distilled, the natural water furnishing a porous and opaque ice. River water is used for condensing purposes.

The Cutler Ice Co. has a lake or pond about two miles from Binghamton from which the ice is cut. This company also cuts from the Chenango river in the immediate vicinity of the pond. This present year, they have been forced to buy from the Hygeia Ice Company, of Elmira, the natural ice supply this past winter being deficient. The pond is apparently free from contamination and the river is also apparently free from any serious contamination at the point where the ice is cut. It may safely be said that the Binghamton ice supply is good and does not unfavorably affect the public health.

Water

The water supply of the city was at first entirely from wells and it was not till 1867 that a municipal supply was decided on. A board of water commissioners was then appointed and work proceeded. Large wells were dug by the side of the Susquehanna, into which the water was at first allowed to percolate. Later a direct connection with the river water was made. These wells are still in use and form the pump wells of the present system, at some time of the year furnishing an appreciable amount of the water.

The distribution pipes in 1867 were cement lined wrought iron which proved short lived, and had to be replaced. The last of this pipe was only taken out in 1890. In 1902 a mechanical filter plant was installed, and to-day the water system is most complete and efficient, a municipal plant of which citizens should be proud. The equipment consists of two intake cribs, one near the pump station and the other one-half mile up stream well out into the middle of the Susquehanna river. A 30-inch pipe from the former and a 36-inch pipe from the latter lead to wells in the pump yard. From the wells the water is pumped to the filters whence it flows back to the pump well for distribution. Three 12,000,000-gallon pumps are available for distribution in the mains, two Holly Gaskill, four cylinder compound condensing pumps and one Snow Cross compound condensing pump. Two return tubular boilers and two B. & W. water tube boilers furnish ample steam power.

The National Board of Fire Underwriters, after an exhaustive study of the distribution system and of the pressures available at different points, (the report being dated December 1908) concludes that the water supply is from an adequate source with ample pumping capacity; that the consumption is high (150 gallons per head per day) and that on account of a few small lines of pipe the pressure in some places is not high when large amounts of water are being drawn. They recommend the addition of a few lines of 12-inch pipe, chiefly to strengthen the pressure in the outlying districts. They also recommend, and the recommendation, the writer was informed, is likely to be carried out, the construction of a 10,000,000-gallon reservoir on Prospect Hill, to secure better pressure and to make the water supply more reliable.

The quality of the water has been vastly improved by the construction of the filter plant. In 1893, as already stated, the sewage of the State Hospital, which up to that time had been discharging into the river, was taken out and discharged below the dam. A special act of Legislature (Par. 74 of the Public Health Law) was passed prohibiting the discharge of any sewage into the river between Binghamton and a point eight miles upstream under penalty of a fine of $25 for the first day and $10 per day for each day the offense continues. But the quality of the water was not good and a continuously high death rate from typhoid fever resulted in the construction of the filter plant. Since that time the improvement in the quality of the water has been most marked and in no particular more than in the typhoid death rate as shown in the diagram, page 707. The number of bacteria in the filtered water is generally fifty or less and the bacterial efficiency of the plant runs from 97–99.6 per cent. The diagram shows the number of bacteria in the raw water, in the filtered water and the filter efficiency at the times of analysis (about once a week) for three years, 1904–1906–1908. But even with the great improvement which the filters have made in the water supply, there is still the necessity for careful watchfulness. While the bacteria in the filtered effluent are usually low, occasionally they are in excess of a reasonable number. For example, in 1908, on February 15th, there were 147, on March 17, 360, and on July 25th, 460 per c.c., and probably these indicate a week or more of continuously high content. The deaths from typhoid were distributed as follows through the year. In May there was 1, in July 2, in August 1, in October 2, and in November 1. Until the milk supply is under bacterial control it is quite impossible to say that cases come from milk or water pollution, but as long as there are seven or eight deaths from typhoid in the city a year, with probably at least fifty cases, vigilance to secure a pure water supply should not be relaxed.

The following table shows the amount of water pipe, and the sizes, as laid through the city:

1-inch	948 feet
1½-inch	345 feet
2-inch	1,823 feet
4-inch	65,546 feet
6-inch	248,917 feet
8-inch	85,418 feet
10-inch	10,682 feet
12-inch	35,198 feet
16-inch	771 feet
20-inch	6,780 feet
24-inch	1,178 feet
30-inch	96 feet
	457,702 feet=86.68 miles.

This amounts to 86.68 miles on 91.63 miles of accepted streets showing how generally the water system extends over the entire city.

Summary

(1) Binghamton is a city of average or normal characteristics, its chief manufacturing interest being cigars, in which about 2,000 employees are engaged.

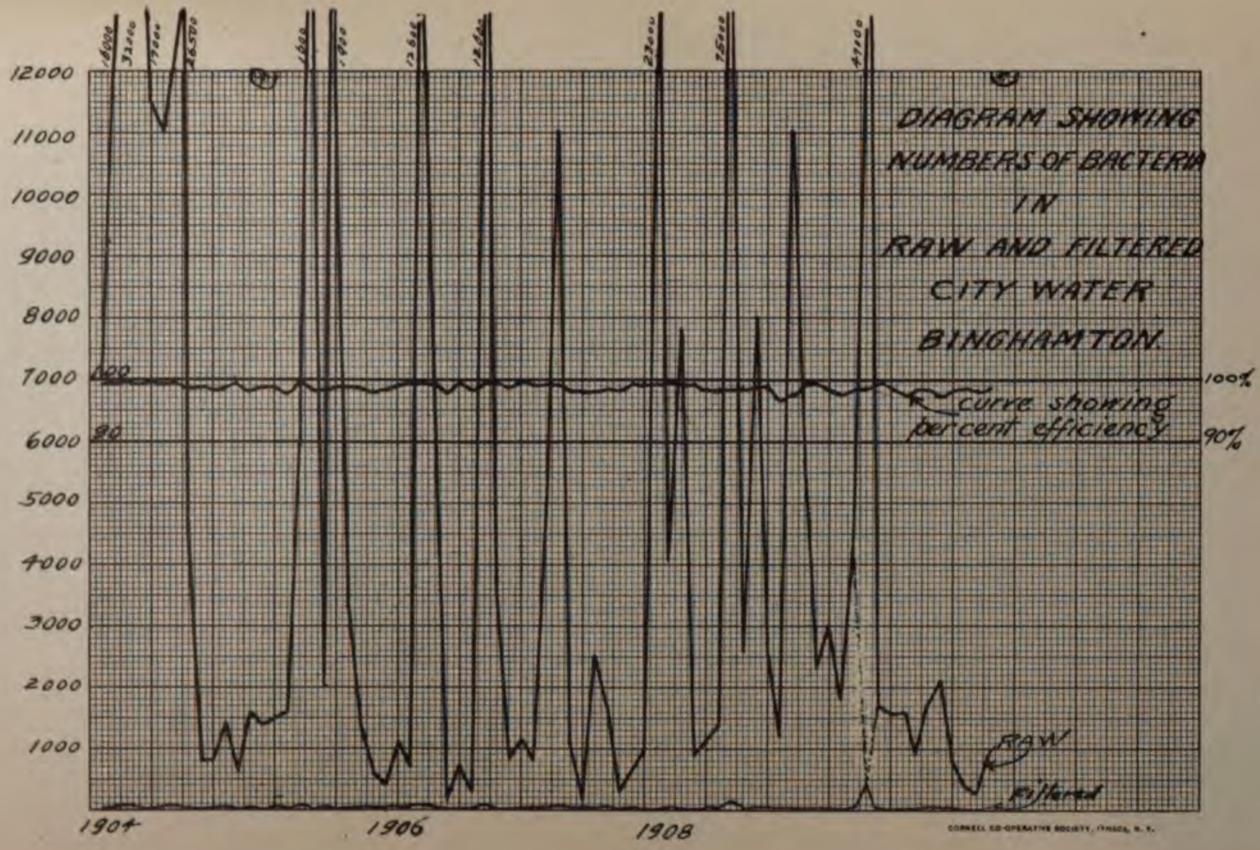


DIAGRAM SHOWING
NUMBERS OF BACTERIA
IN
RAW AND FILTERED
CITY WATER
BINGHAMTON.
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
100
90
100%
90%
18000
32000
17000
26500
1600
1900
13600
18600
23000
75000
47100
curve showing
percent efficiency
RAW
Filtered
1904
1906
1908
CORNELL CO-OPERATIVE SOCIETY, ITHACA, N. Y.

(2) The social conditions of the citizens are normal, the foreign population being small; the density of population is not marked and the living conditions are usually good. Apparently the number of children is fewer than the normal affecting both the general death rate and the death rate of children.

(3) The general death rate in Binghamton is 17.2 for the nine years 1900–1908, which is an average rate, corresponding closely with other cities of the United States of the same size. If a correction be made for the small number of children, the rate would be increased to 22.0, a markedly high rate.

(4) Since the construction of the filter plant the death rate from typhoid fever has been low, when compared with other cities of the United States, and is in marked contrast to the rates before 1902. It should be a matter of great pride to the city to continue to maintain this low rate and a rate of 10 per 100,000 or less should be the constant ideal of the Water Company.

(5) The death rate of children under five is apparently low (33.8 as an average for the past nine years, although in 1908 it reached 46.0), but since the rate depends directly upon the number of children, and since the number is undoubtedly below the normal, the apparent low rate is misleading. If corrected for the deficiency the rate would be high, and in view of the good quality of the water, suggests the need of a more thorough control of the milk supply.

(6) The milk supply is under municipal control, theoretically. Practically, the control is only partial, and does not include an inspection of all the milk supplied to the city. No registration of milk dealers and producers is required and the efforts of the inspector are limited to irregular inspection of farms and sampling of milk as opportunity offers. A bacterial standard of quality is established, but no authority is exercised to shut out milk not conforming to this standard.

(7) The method of garbage collection is most inefficient and calls for immediate improvement. The city should install a system of municipal collection, thereby ensuring a prompt and regular removal of putrescible matter from houses and stores as well as its sanitary disposal. From an esthetic standpoint, the littering of the river banks, which might be so picturesque an element of

the city, with old cans, manure, and other garbage is a municipal crime.

(8) The sewerage system is on the combined plan and discharges the sewage directly into the two rivers. The volume of the latter is not sufficient to prevent a nuisance at times of low water and plans for purification of the sewage have already been called for by the State Department of Health. The system of sewers is in great need of revision, in view of the future construction of a disposal plant and in view of the inadequacy of the sewers in certain parts of the city.

(9) The pavements of Binghamton are small in extent and quite incommensurate with the importance of the city. Only 13 per cent of the streets are paved and much of this is asphalt, so worn and rutted as scarcely to deserve the name of pavement. The streets are kept as clean as may be, under the circumstances, but this condition is not a credit to the city.

(10) The ice supply is chiefly artificial and is of good quality.

(11) The water supply comes from the Susquehanna river and since 1902, has been filtered through filters of the mechanical type. Judged both by the analyses of the water or by the typhoid fever death rate, the quality of the water is exceptionally good.

Conclusions

The writer is brought to the conclusion, after the personal visit to Binghamton, after a tabulation of the mortality statistics of the city and after a careful study of the same, that Binghamton is a normally healthy city, and needs only some moderate improvements to be an unusually sanitary and healthful as well as esthetically attractive city.

In order to improve present conditions the following suggestions are offered:

(1) A municipal system of garbage collection ought to be inaugurated, by which semi-weekly collections of putrescible matter should be made. The disposal of the material may be on land as at present, although a garbage crematory should in time be constructed.

(2) The present method of supervising the milk supply ought to be extended until it is certain that every farm or dairy pro-

ducing milk is examined at least twice a year. The systematic examination of the milk supplied by all dealers ought to be insisted upon and further delivery of milk not reaching the bacterial standard set, rigorously prohibited.

(3) The sewerage system ought to be taken in hand so that further construction may be made with reference to ultimate separation of the domestic sewage and treatment of the same. Studies for a disposal plant ought to be undertaken in this connection.

(4) A general and systematic policy in reference to street pavements ought to be adopted whereby the streets of the city may be as rapidly as possible converted into clean and suitable pavements.

(5) For the greater reputation of the city, a landscape architect ought to be employed to advise the city as to the treatment of its river banks, so that the present piles of garbage and ashes may be converted into attractively shaded and terraced walks, or drives, for which these banks are naturally so well adapted.

Respectfully submitted,

H. N. OGDEN,

Special Assistant Engineer

GENEVA

ALBANY, N. Y., *July* 27, 1909.

MR. THEODORE HORTON, *Chief Engineer State Department of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report covering my investigation of the sanitary condition of the city of Geneva:

History

When General Sullivan made his memorable expedition against the Indians in 1779 he marched from the Susquehanna river and the present city of Elmira northward along the eastern side of Seneca lake. On the 7th of September Sullivan crossed the outlet of Seneca lake and came upon the Indian town of Kanadesaga, the Seneca capital, containing about sixty houses, with gardens and numerous orchards of apple and peach trees. This Indian town, about a mile and a half northwest of the present city of Geneva, was entirely destroyed, the houses burned and the trees cut down, thus destroying the first village on this site. By the year 1796, white settlers had so poured into this rich agricultural country that the village of Geneva had become an important frontier town. The street on the west shore of the lake was laid out, a large country house built at the southern end and a tavern and a number of other small houses were occupied. A sloop of forty tons burden was built to run the length of the lake. A printing office was established and a small weekly paper was published. In the next year the main highway from Utica to Geneva had been built and a weekly post established. In 1800 there were 60 families, and among the residents were three lawyers, two doctors, and representatives of nearly all the trades. In 1816 there were 75 buildings and 325 people, which latter number by 1833 had increased to 3,029, brought to that country by the abundance of rich agricultural land in the immediate vicinity. An old building still standing at the foot of the lake near the outlet is pointed out as the first hotel built in this part of the State, and for a long time noted as a road house on the old trail. The present Sanitarium or Hygienic Institute, facing the small park on Main street, contains part of a large tavern built by Captain Williamson more than one hundred years ago. In the Pulteny Street cemetery is an old gravestone inscribed to the memory of Martha Williams, who died on May 9, 1794, and another stone is to the memory of Betsy Cole, who died in 1801. A number of other stones have dates between 1800 and 1810. Geneva is thus one of the oldest cities of the State, west of the Hudson and Mohawk valleys. It has grown from being a mere outpost in the wilderness, through successive stages of development until it has become a thriving city of the State. It has preserved, however, largely through the influence of its agricultural resources and its scenic attractions, a regard for the health and comfort of its citizens, the streets being wide and lined with spreading shade trees, the houses separated and surrounded by well-kept lawns, shrubbery, etc. The tenement house district, so conspicuous in many cities, is almost absent in Geneva. The very appearance of the city, the type of residences, and the character of the population indicate in advance a probably low death rate and a high value in the health conditions of the city.

The opening of the Erie canal in 1825, its main line being fifteen miles north, diverted the through traffic from Geneva and left it stranded to the south. With, however, a few years later, the consolidation of the Vanderbilt roads made possible through railway traffic, Geneva was again on the highway. When the shorter line from Syracuse to Rochester was built in 1850, Geneva was again stranded on what is now called the "Old Road" and the comparatively slow growth of Geneva in recent years is partly due to this shifting of the main line of travel to the north.

Topography

The topography of the city is shown in the map attached (Fig. 1). The city is located at the northwestern corner of Seneca lake, partly on low ground near the water and partly on a bluff or plateau which rises from the western side of the lake to a level about sixty feet higher. The outlet from the lake is at the northeastern corner and is not shown in the figure. A small amount of swamp land lies along the New York Central Railroad, part of which is filled in with city refuse, to be later converted into a city park. The surface slopes are such that drainage generally is easily provided and a recently built stone dyke along the north end of the lake gives promise of an ultimate improvement of the present swamp areas. As a railroad center, Geneva should take a high rank, although curiously it is not a division point and has none of the characteristics of a railroad town, such as Elmira or Port Jervis.

Figure 2 shows by exaggerating the railroad lines the communication facilities leading out in all directions. From the south are the two lines of the Lehigh Valley and the Pennsylvania Division of the New York Central from Corning. On the east and west the New York Central connects Syracuse with Rochester and Buffalo, and the Lehigh Valley Railroad runs through the city on its way from Buffalo. The New York Central also extends to Lyons and the main line. Two small branch lines of the Lehigh, one to Naples and one to Seneca Falls have Geneva as one terminal. One suburban trolley runs from Geneva to Rochester and another, extending now to Cayuga lake, is soon to be extended across the lake and on to Auburn.

The Seneca Lake branch of the Erie canal runs parallel to the north end of the lake, extending the Geneva harbor at the northwest corner of the lake and the Seneca river at the northeast corner. During the last session of the Legislature (1908–9), an extension of the Barge canal on this route has been authorized by Legislature, so that whatever benefits may accrue from this larger canal will not be lost to Geneva.

The following description of the topography is taken from the 15th Annual Report of the Department, page 53:

Directly north of the lake the tract of nearly level ground rises to an elevation of about ten or twelve feet above the lake, and extends back three quarters of a mile to the north line of the village.

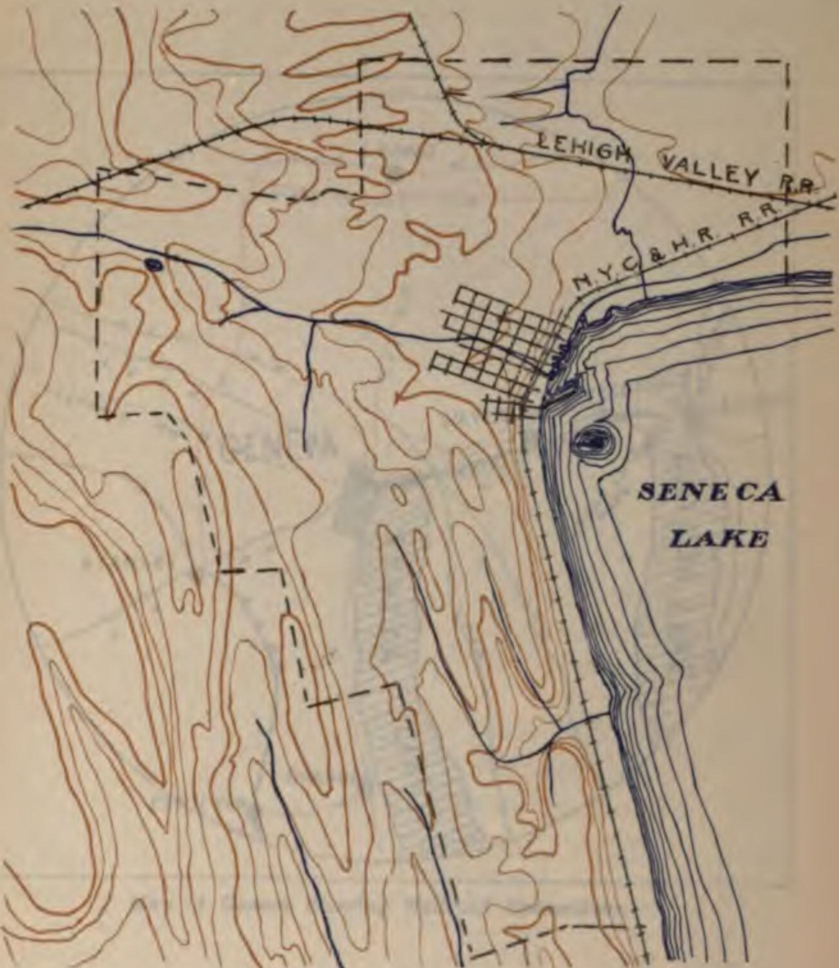
The drainage from this tract and also from a strip of land to the westward, about one half of a mile wide, and rising to an elevation of sixty feet above the lake, is carried off through Marsh creek, which enters the village from the north and empties into the Seneca and Cayuga canal, 2,000 feet from the inlet lock. This stream is a feeder to the canal, and it is liable to freshets which overflow its banks and inundate about forty acres of land within the village limits.

At the extreme northwest corner of the lake another creek enters the canal. It flows through a ravine, crossing the streets diagonally, and takes its rise about one mile to the northwestward.

About 500 feet to the south of this creek, Castle creek enters the canal basin outside of the guard lock. The stream has quite a large drainage area to the westward, and flows through a ravine, crossing the streets diagonally. Its channel is generally from eight to ten feet below the streets which it crosses, passes through backyards, and in many cases has been covered over and buildings have been erected immediately over it.

One thousand feet south of Castle creek, and in front of the main business portion of the village, Cemetery creek enters the lake, flowing from a generally westerly direction through the center of blocks and diagonally across them in a deep ravine for nearly a mile.

South of Cemetery creek and along the lake shore, the ground rises rapidly to a height of about 100 feet above the lake, but a quarter of a mile from the lake another depression occurs in which



Map of Geneva Showing Topography.

a stream flows to the south and empties into the lake at the south end of the village at Mile Point, where it is joined by another stream which flows from the west and north, about one half a mile west of the lake, extending up to the divide of the Cemetery creek valley.

These various streams traversing the village, afford excellent opportunities for surface drainage and the carrying off of the rain water which flows from the steep slopes of the streets without injury to property or expensive construction for rain water sewers.

It will not be out of place to note that the unrivaled beauty of the residence sites on Main street were early appreciated, and when in 1800 Captain Williamson laid out his building lots he sold them with the stipulation that no buildings should be erected on the east side of the street, so that the view of the lake might be kept open. This has not been entirely observed but it has resulted in a street famous for its attractive appearance and for the architectural elegance and evident comfort of its bordering homes.

Industries

The United States Census Report for 1900 gives the total number of establishments in Geneva as 161, with an invested capital of $2,617,661, employing 1,586 wage earners who receive $689,101 in salaries per annum. Only twenty children were employed in Geneva in 1900, which should react favorably upon the death rate of the city.

The value of products manufactured was $3,366,806, and the following table shows the relative importance of Geneva in manufacturing among cities of about the same size in New York State:

Name	Population	Wage earners	Products (value of)
Dunkirk	11,616	2,615	$5,393,053
Glens Falls	12,613	3,280	4,571,253
Corning	11,061	1,965	3,061,172
Geneva	10,433	1,586	3,366,806
Hornell	11,918	1,757	2,873,670
Johnstown	10,130	3,884	5,480,072
Little Falls	10,381	3,221	4,364,994
North Tonawanda	9,069	1,718	6,445,836

All but two of these cities show a higher value in products than Geneva, and all of them employ more wage earners. **According** to the statistics for New York State (1900) **Geneva w** thirty-sixth city in relative population and thirty-fifth in the value of manufactures. The table, therefore, showing that the number of wage earners is small, compared with other cities whose value of products is as large or larger, indicates that the wage earners are of a superior type, skilled workmen; and the type of manufactures confirms this. Boiler works, engine works, optical supplies, stove works, corn and wheat milling are the principal types of manufacturing concerns, and they all employ skilled operators. This would naturally react favorably upon the health conditions, since any influx of unskille born inhabitants with their attendant insanitary modes of livin is thereby lessened, and on that account, the death rate, thro the superior intelligence of the citizens, is maintained at a co ntly low rate. This will be seen later. The principal manu ing concerns of Geneva are as follows:

Fay and Bowen Engine Company.
Vance Boiler Works.
Herendeen Manufacturing Company.
New York Central Iron Works Company
Geneva Wagon Company.
Standard Optical Company.
The Patent Cereals Company.

Sociology

Except as already described, the sociological conditions in Geneva present no very marked peculiarities. Like many other cities in this section of the State the city is essentially a residential community. It has in many ways preserved all the essentials of an old country village. The lots are large. The houses are separate and yet there remains the old-time village neighborliness and community interest. This may come from the presence of an unusually large number of citizens of both sexes of more than middle age, men and women who have remained in this same city while the sons and daughters have moved away, or who have returned to their childhood scenes to enjoy their declining years. There is thus, and local history generally corroborates it, an air and appearance, in spite of the manufacturing interests, of leisurely culture about the city, of wealth without osten on, and of a general interest in municipal affairs. Of late years, however, there has developed a considerable foreign population, dating presumably from the time of the construction of the Lehigh Valley railroad, about fifteen years ago. They now form a large colony, not only in the section of the city known as "Little Italy" on the outskirts of the city, but are to be found on a number of the streets of the city itself, in some cases occupying pretentious and expensive houses. From the United States census of 1900, the native born population was 8,517, and the foreign born population 1,916, the ratio of the latter to the former being, therefore, 22.4 per cent. Residents of Geneva estimate the present number of Italians living in the city as 1,300, about 10 per cent. of the present population. This alien population offsets in many ways the cultured class already referred to, increasing the proportion of children to the total population, reducing the general standards of living, and raising the death rate. The ratio of foreign born population is small, compared with Dunkirk, for example, where the foreign born population is nearly half the total population, and yet without doubt it materially affects any estimate of health conditions in the city as measured by the death rates.

In 1900 there were in Geneva 2,261 dwellings, housing 10,433 people, or an average of 4.6 persons per dwelling. This is very low compared with Schenectady, where there are 8.1 persons per dwelling. In this same year, also, there were 2,467 families in Geneva, or 1.09 families per dwelling, which indicates a high standard of living and a satisfactory condition of housing. Or, if we divide the population by the number of families we find that there are on the average 4 persons per family in Geneva, which is low and indicates a small proportion of children. This will be referred to later under mortality.

From the standpoint of sociological conditions, therefore, Geneva is evidently a healthful city and should have a low death rate, were these conditions all that affected the rate.

Geneva has not grown as rapidly as some other cities of the State, particularly during the latter half of the last century. It is now, however, coming under the influence of certain factors which are causing buildings to be built in large numbers. Last year (1908), for example, 100 new houses were built within the city limits, chiefly on the rising ground west of the lake. The following diagram shows the rate of growth of the city since 1800 and indicates the unmistakable tendency towards a more rapid rate of growth during the last few years.

Mortality

The following table gives the general death rate for Geneva for the nine years since 1900:

TABLE SHOWING THE GENERAL DEATH RATES IN GENEVA PER 1,000 POPULATION FOR THE PERIOD 1900–1908

Year	Population	Deaths	Rate per 1,000
1900	10,433	154	14.7
1901	10,796	176	16.3
1902	11,159	167	14.9
1903	11,522	174	15.1
1904	11,885	187	15.8
1905	12,249	169	13.8
1906	12,612	203	16.1
1907	12,975	173	13.4
1908	13,338	151	11.3
Average	....	....	14.6

This gives an average general death rate of 14.6. As may be seen by comparison with the following table, this is an unusually low rate. This table is taken from the reports of the United States census office, and gives the general death rates for cities in the ten states named:

TABLE SHOWING GENERAL DEATH RATES PER 1,000 POPULATION FOR CITIES IN NEW YORK AND OTHER STATES FOR THE FIVE YEAR PERIOD 1903–1907

	1903	1904	1905	1906	1907	Average	Final average
New York	17.4	19.2	17.8	18.0	18.3	18.1	16.9
Connecticut	16.8	16.1	16.9	17.3	17.6	16.4	
Indiana	14.6	15.7	14.0	14.1	14.0	14.8	
Maine	18.4	19.5	17.9	18.1	18.9	18.5	
Massachusetts	16.9	16.4	16.9	16.8	17.7	16.9	
Michigan	14.9	14.3	14.6	15.9	15.7	14.6	
New Hampshire	16.9	16.1	18.1	18.1	17.6	17.0	
New Jersey	17.4	19.0	17.5	18.0	18.2	17.9	
Rhode Island	18.9	17.2	17.1	17.0	18.4	17.9	
Vermont	17.9	17.1	18.3	18.0	16.5	17.1	

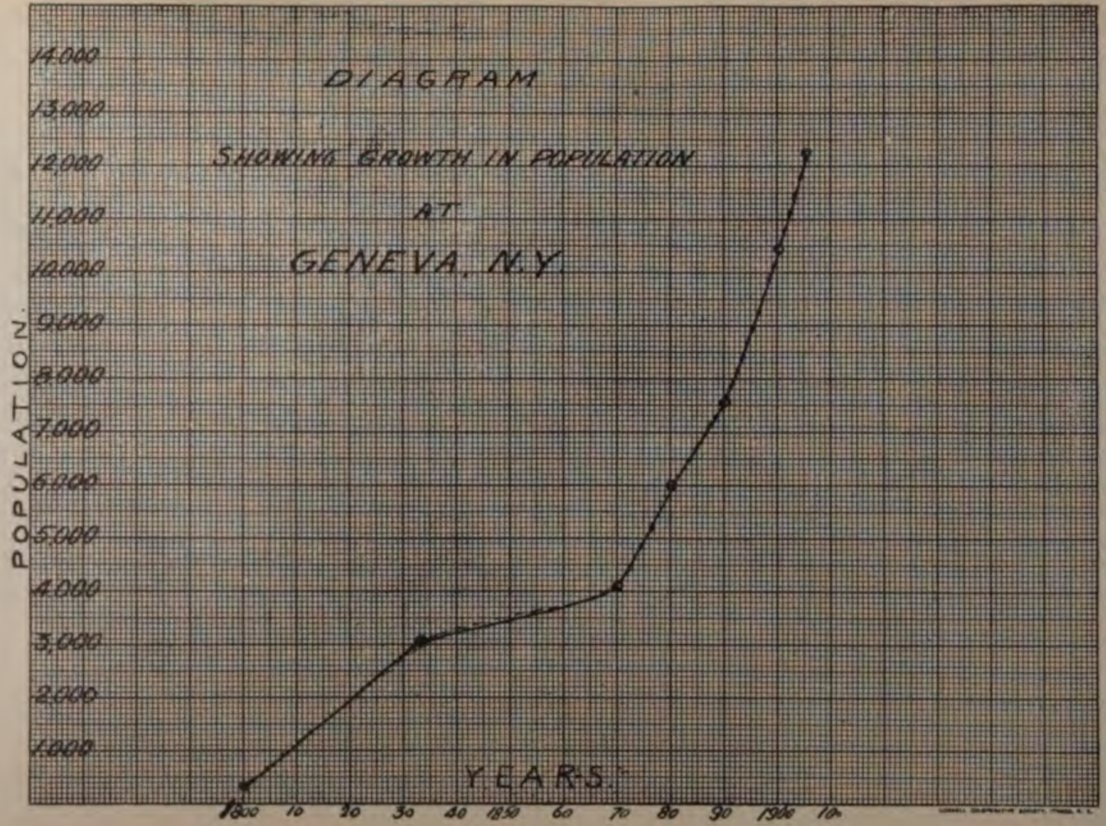


DIAGRAM
SHOWING GROWTH IN POPULATION
AT
GENEVA, N.Y.
POPULATION.
14,000
13,000
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
YEARS.
1800
10
20
30
40
1850
60
70
80
90
1900
10

The lowest of these is Michigan with a general death rate of 14.6, or just equal to that of Geneva.

Or. we may compare the Geneva general death rate of 14.6 with the average general death rate of the sixty-three cities in the United States whose populations are between 10,000 and 15,000, and which are included by the United States census office among the registration cities. The average death rate of these sixty-three cities for 1900–1905 inclusive, was 16.2 Compared with cities of its own size in the United States, or with the death rates of states, Geneva has a very satisfactory death rate and it is safe to conclude that its general death rate is low.

A low general death rate, however, does not necessarily mean that the particular death rates from all the various diseases and causes which go to form the average are low. For instance, let us investigate the typhoid death rate of Geneva.

The following table gives the typhoid death rates for the period of years 1900–1909 inclusive. They are taken from the reports of the United States census office:

TABLE SHOWING THE TYPHOID FEVER DEATH RATE PER 100,000 POPULATION IN GENEVA FROM 1901–1905, INCLUSIVE

Year	Population	Deaths	Rate per 100,000
1900	10,433	0	00.0
1901	10,796	5	26.3
1902	11,159	1	8.9
1903	11,522	6	52.0
1904	11,885	5	42.3
1905	12,249	4	32.8
1906	12,612	5	39.6
1907	12,975	3	23.2
1908	13,338	2	15.0
Average	....	....	28.9

This gives an average of 28.9. The typhoid fever death rate for the United States registration area is 32.2. This would suggest that the typhoid rate of Geneva is about normal, but if we compare the death rate from typhoid fever which is prevalent in the United States with the rates prevalent in other countries, quite a different conclusion must be drawn. The table below gives the typhoid fever death rates per 100,000 population in a number of the countries of the world, including the United States:

TABLE SHOWING TYPHOID FEVER DEATH RATES PER 100,000 POPULATION IN THE UNITED STATES AND OTHER COUNTRIES

COUNTRY	1902	1903	1904	1905	1906	Average 1901–5
U. S. Registration, area	34.4	34.3	31.9	28.1	32.1	32.2
Australasia	20.5	25.5	15.5	13.7	15.7	19.0
Austria	18.1	19.7	19.3	......	......	19.9
Belgium	17.8	15.6	14.9	13.7	......	16.8
Germany	7.0	7.3	7.0	6.3	......	7.6
Italy	34.6	35.5	36.9	32.7	28.1	35.2
Japan	11.4	9.8	10.8	13.2	......	11.6
Spain	45.8	43.4	44.4	37.7	42.2	44.5
Sweden	10.4	5.3	5.1	......	......	8.3
Switzerland	6.0	5.0	7.7	5.0	......	6.2
England and Wales	12.6	10.0	9.3	8.9	9.2	11.2

This table shows that outside of the United States there are only two other countries in the list which have as high or a higher typhoid fever death rate than Geneva, and these two countries are notoriously high. No other countries on the list even come up to 20.0, the nearest being Austria with 19.9 per 100,000. Naturally, the fact must not be lost sight of that when as few as two, three, four and five deaths occur annually in a city a very slight error in reporting would make an immense change in the rate per 100,000 inhabitants. It is more probable, however, that some cases were not reported, than that too many cases were reported, and besides, if the high rate were due to errors, it would not be so consistently high. We must conclude, therefore, that the average typhoid fever rate in Geneva is high and that, by proper sanitary precautions, the rate could be lowered at least 10 per 100,000. Geneva has a population of about 13,000 so that a reduction in the typhoid rate of 10 per 100,000 means 1.3 in 13,000 or 1.3 lives in Geneva's population. It is a common and a reasonable assumption that for each life lost by typhoid there are ten cases of illness. From the standpoint of dollars and cents the loss is considerable. Whipple estimates conservatively that, including the accompanying cases of illness and the lives lost from other diseases, but saved in a reduction of the typhoid rate, each death from typhoid fever represents a loss to the community of $10,000, or, for Geneva, it is apparently possible by reducing the typhoid fever death rate from its present average value to one more nearly normal, to save $13,000 per year, representing capitalized, the sum of $260,000. Unfortunately, however ready any family might be to contribute its share of this sum, when the dread disease has found its victim, it is rarely possible to secure any contribution based on the showing of cold figures and statistics. The table shows that the rates were highest during the period 1903–1906 and that in 1908 the rate was satisfactory at 15.0. It is of interest, therefore, to ascertain, if possible, the cause of such variation in the typhoid rate and then to eliminate this cause.

Turning now to the death rates of children under five, we have the following table:

Table Showing Death Rates per 10,000 Population of Children Under Five Years

Year	Population	Deaths	Rate per 10,000
1900	10,433	31	29.7
1901	10,796	33	30.6
1902	11,159	41	36.8
1903	11,522	30	26.1
1904	11,885	29	24.6
1905	12,249	32	26.2
1906	12,612	29	23.0
1907	12,975	34	26.2
1908	13,338	21	15.8
Average	....	....	26.6

This average of 26.6 is quite a satisfactory rate when compared with the normal rate for cities in the United States, namely 49.6. This is not surprising, however, when we consider that the general death rate is low and that the typhoid fever deaths are only from 2 to 5 in number. This would indicate that there is no congestion of population, and no conditions of housing which tend to make the infant mortality high. Moreover, since impure milk would immediately make itself evident in an increased death rate among children this low rate argues in favor of the purity of the milk supply. Of course, it may be that this low rate is due to the scarcity of children, which would also materially affect the general death rate, making it higher were there more children. This is seen to be quite probably the case when we remember that there are only on the average 4.2 members per family in Geneva.

However, although raising the proportion of children up to the normal would undoubtedly make the general death rate higher, it is doubtful whether it would raise it up to a point where it would be considered dangerous.

It has been found that in the cities of the United States where the proportion of children is normal the ratio of deaths under five to total deaths is about 30 per cent. In the registration area of the United States in 1906 there were 444,288 deaths at all ages, and 132,273 deaths under five which gives the above ratio of 30 per cent. (nearly). In Massachusetts, for this same year there were 50,431 deaths from all causes and 14,902 deaths under five, or a ratio of 33.8 per cent. In New York State for the same year, the ratio of deaths under five to total deaths was 35.4. Turning now to Geneva, we have the following table:

Year	Death	Under five	Ratio
1900	154	31	20.1
1901	176	33	18.7
1902	167	41	24.6
1903	174	30	17.2
1904	187	29	15.5
1905	169	32	18.9
1906	203	29	14.3
1907	173	34	19.6
1908	151	21	13.9
Average			18.1

Here the average is 18.1 per cent. and in the whole period of nine years never went above 24.6. Therefore we are again brought to the conclusion that either Geneva is surrounded by conditions which are very favorable to the health of children, or that there are but few children, and indications point to the proportion of children in Geneva being small. We can conclude from this table that, in connection with the table just preceding, the death rate of children under five is low in Geneva, and that, inferentially, the supplies of water and of milk are good. It is interesting to note the low values for 1908 in both tables in view of the discussion on milk which is to follow.

In reviewing the various sets of death rates, therefore, it must be concluded that, except for two or three excessive deaths from typhoid fever each year, accompanied by eight to ten times as many cases of illness, Geneva is a city where unusually healthful conditions prevail. The high typhoid rates may be caused by impure water, impure milk, fresh vegetables, flies, etc., and the following discussions will serve to bring out the general sanitary conditions of the city and the importance of each possible factor named.

Milk

The milk supply for Geneva comes from about forty farms on the outskirts of the city. Formerly this milk was collected and distributed by twelve retailers, some distributing only milk from their own farms, and others collecting from half a dozen farms. Within the past year, however, a co-operative method of distribution has been inaugurated by which the milk is brought in to one of two distributing centers, there mixed, pasteurized, and bottled for distribution. It may be safely said that in its attitude towards the milk question, the board of health of Geneva has displayed unusual wisdom and energy, and their method of improving the quality of this article of food may well be taken as a model by other cities. The committee on dairy products, in 1907, feeling that there was not proper supervision and inspection had passed by the local board of health an ordinance, by which no person could sell or deliver milk or cream in the city from any farm, unless the manager or owner had fully complied with the dairy rules of the board. An inspection of all dairy farms from which milk was taken was at once instituted, and has been continued four times a year since. The score card of Commissioner Pearson is used. At the first inspection, September 1907, the average score was 411, the forty farms being graded as follows: Excellent, none; Good, 2; medium, 23; poor, 15. In September 1908, after two intermediate inspections, and after publications of the scores, this grading had been changed to: Excellent, 1; good, 21; medium, 16; poor, none; and the average score was 449. The effect of this improvement, is, I believe, plainly shown in the decreased death rate among children for 1908, as shown in the tables on page 735 of this report. The rules require all persons distributing milk to have a license, to avoid delivery in bottles at houses where contagious diseases exist, to avoid filling [illegible] glass bottles in the barn, in the stable or in the street. No milk tickets can be used twice, and a penalty of $50 is imposed for every violation of any of these rules. The city is unusually fortunate in having the State Agricultural Experiment Station located in the city and in having the dairy bacteriologist, Mr. H. A. Harding, a member of the local board of health and of the dairy products committee. The committee is not yet satisfied that their milk supply is in every way perfect, but it is certain that it is being carefully looked after, and since 1907, not responsible for the high death rates in the city.

Garbage

The matter of collecting and disposing of garbage in Geneva is as yet not properly perfected. There is no municipal system of collection and each householder makes such arrangements with farmers individually as may be convenient. Some years ago the local board of health authorized certain farmers to have the exclusive right to collection, each in one ward of the city, subject to certain sanitary restrictions, but this was discontinued after a short trial. The sanitary code prohibits throwing garbage, etc., into any street, or keeping putrid or decaying organic matter in any cellar or out-building more than twenty-four hours. No other regulations are to be found, however, governing the collections or disposal. In his annual message at the close of 1907, the mayor, the Honorable A. P. Rose, cites a list of public works and functions which must be undertaken by the city in the near future, and second in order of importance he places the collection and destruction of the city garbage. It is a matter, therefore, which is being agitated, and which will be undoubtedly taken up by the city in the near future. The street sweepings and city and building rubbish is dumped in the low land to the north of the lake, particularly in the vicinity of Middle and Syndicate streets. A laborer is constantly in attendance, and keeps the dump leveled off, the papers and other combustibles burned up and the organic matter buried. The plans of the city officials contemplate converting this dump into a children's playground and a surface covering of earth was being given at the time of the writer's visit, swings, etc., having been already ordered.

Sewage

In 1893, plans for the sewerage system of Geneva were submitted to the State Board of Health by the sewer commissioners and on February 9, 1894, duly approved. While the pipe system was at once found satisfactory, the method of disposal was much criticized, and it was only after considerable hesitation, and after the opinions of Mr. J. J. R. Cross, engineer for the commission, of Mr. G. W. Rafter, and of Mr. Allen Hazen had been distinctly given to the effect that the proposed method of disposal could cause no local nuisance and no damage to the residents of Geneva or other towns in any way and that the proposed direct discharge of the raw sewage would be without prejudice to the water supplies of Geneva and of Waterloo, that permission was finally granted.

This plan, finally approved and executed, collects the sewage of the city into three outfalls, one discharging into the lake at the north end at the mouth of Marsh creek, a second discharging at the foot of Castle street at the northwest corner of the lake, and the third discharging into the lake on the west side about a mile south of the basin or harbor. Each of these outfalls is 18 inches diameter and extends about 600 feet from the shore line, or to a point where the water is ten feet deep. These outfall pipes are wood stave pipes, weighted with steel rails, similar to the pipes in use at New London, Conn., and at Ithaca. The writer visited all three outfalls, but could detect no odor or sign of pollution, and the prophecy of the experts has been verified. No data are available by which to judge conclusively of the effect on the water supply of Geneva, though the matter will be discussed under the head of water supply. The city is well supplied with sewers, only one street, viz., Lake road between the lake and the canal, being without such facilities. This street, containing about a dozen houses, is so low that it cannot be sewered without pumping and the houses which face the road and extend to the canal at the back discharge their drainage into the canal.

The blue print attached shows the sewerage distribution system and the following table shows the length of pipe in feet and the size in inches constructed up to December 31, 1908:

6"	8"	10"	12"	14"	15"	18"	20"	Total
1,890	107,751	9,497	9,957	239	3,236	2,435	1,475	136,015

This makes a total of 25.76 miles of sewer, as compared with 29.75 miles of streets laid out within the city limits, a comparison which indicates the general distribution of the system. It cannot be questioned but that in due course of time, Geneva will be led to purify at least partially, her sewage before its discharge into the lake. Whether moved to do this by her own sense of decency or by the rulings of State authority, sooner or later such action will inevitably be taken. Already the matter has been discussed in Geneva, and in the report of Mayor Rose, already referred to, he includes among the list of additional public works which the city must undertake in the near future "some system of sedimentation or purification of sewage so that impure matter shall not be discharged into the lake." When this shall have been accomplished the sewerage system will have been, except for extensions to meet the needs of the growing city, completed and in satisfactory condition.

Besides the sanitary sewer system above referred to, the city has about eight miles of storm water sewers, divided among the different sizes as follows:

8″	10″	12″	15″	18″	20″	24″	30″	36″	Catch basins
583	2,231	32,172	2,803	2,428	5,060	3,800	1,450	4,250	333

The natural drainage channels, supplemented by these drains give ready relief to storm water and except in a few localities in the outskirts where the natural watercourses have been restricted, the city is well drained.

No evidence is available to show that either by inadequate sewerage distribution or by improper sewage disposal, the health of the city is affected.

Pavements

Geneva claims to have more miles of pavement in proportion to the total miles of street than any other city of equal population in the United States, and the impression of the writer in visiting the different parts of the city was that it was all well paved. All the streets in the central parts of the city are paved and on Main street, on Washington street, and on Castle street the pavements extend well out into the suburbs. The following table gives the total amount of the different kinds of pavements to December 31, 1908, in miles:

Brick	5.669
Asphalt	1.178
Medina	0.187
Macadam	4.431
Tar macadam	2.479
Creosote block	0.085
Cobble stone	0.161

This is a total of 14.19 miles out of 29.79 miles of streets laid out within the city limits. As indicating the civic pride of Geneva the following table shows the amount of money expended each year in street improvements since 1898:

Total cost of pavements laid in 1898	$116,558 11
Total cost of pavements laid in 1899	87,598 74
Total cost of pavements laid in 1900	43,738 19
Total cost of pavements laid in 1901	66,353 62
Total cost of pavements laid in 1902	48,806 60
Total cost of pavements laid in 1903	58,457 28
Total cost of pavements laid in 1904	38,890 86
Total cost of pavements laid in 1905	15,399 09
Total cost of pavements laid in 1906	2,814 13
Total cost of pavements laid in 1907 and 1908	86,608 76
	$565,225 38

Such a statement cannot but demonstrate the desire on the part of the citizens to have the city fully furnished and equipped with everything calculated to increase the happiness and health of her residents and such an expenditure year after year, without exceeding the statutory limitation of indebtedness shows a high standard of municipal control, and of individual public spirit.

Ice

The ice supply of Geneva comes from Cayuga lake chiefly and is distributed by the Independent Ice Company. A second com-

pany is now controlled by one man named Knippenberger, who is generally known, however, as "Knip" the Ice-man. His ice comes from Keuka lake and apparently no ice for domestic purposes is cut on Seneca lake, although there are two or three large ice-houses in evidence. The Board of Health requires each ice company to file in April of each year the amount of ice they have on hand and where cut. The Independent Ice Company reports this year 11,500 tons on hand, partly in its own ice-house at Geneva and partly in its house at Cayuga. The "Knip" company reports 4,000 tons on hand, partly in its house at Geneva and partly at Keuka lake. The latter company also brings in some ice from Silver lake. No analyses of any of this ice are available but the sources are both admirable, no sewer systems within many miles of the ice field and no objectionable surface drainage. It may be safely assumed that the ice does not affect the health of the residents of Geneva.

Water Supply

As early as 1800, Geneva, consisting then of sixty families, was supplied with water conveyed in pipes from some springs known as the White Springs, and which form a part of the Geneva water supply to-day. They are about a mile west of the lake, at an altitude of about 650 feet above the sea level, Seneca lake being 444 feet, and though no longer able to supply more than a portion of the demand, act as distributing basins, as pressure regulators, and as a source of economy in supply.

The supply is owned and furnished by the municipality, having been purchased in 1896 at an expense of $150,000. An intake pipe, said to extend into the lake to a depth of thirty-five feet leads to two Worthington compound pumps suitably installed in 1887 in a brick building three miles south of the end of the lake. The rising main from the station connects with the city mains any excess going into the springs. The system is thus one of direct pumping, with the springs as regulating basins. The nearest point a sanitary sewer enters the lake below the intake is about one mile, and farther still below this point, a distance is estimated at two miles, one of the main city sewers enters the lake. It is fair to assume that any current in the lake, however, are towards the outlet, from south to north and that the sewage will not find its way back to the water intake. It is said that there are about 150 private and individual sewers entering the lake from residences on the east side of Main street within the two miles above referred to, but these are not likely to influence the quality of the city water. The sewage of Willard Insane Asylum with about 1,500 patients is discharged into the lake on the east side or opposite shore, thirteen miles south of the intake and the sewage of Watkins and of Montour Falls is discharged at the south end of the lake, thirty-five miles distant. The following chemical analysis made March 4, 1909, by the State Hygienic Laboratory show no great evidences of pollution except in the large amounts of chlorine, due doubtless to salt works at Watkins. The alb. ammonia is high and indicates the presence of considerable nitrogenous organic matter.

Color	Trace	Ammonia free	.044
Odor, hot	2. Vegetable	Ammonia albuminoid, total	.124
Odor, cold	1. Sweet		
Turbidity	Trace	Nitrites	.001
Solids, total	252	Nitrates	0.70
Loss on ignition	43	Oxygen consumed	1.05
Mineral residue	209	Chlorine	45.50

The bacterial count is generally unsatisfactory as shown by the following analyses:

1909	Location	No. bacteria	B. col. com.
Feb. 17.	Tap. Am. Ex. Office..	110	Present in 10.cc.
April 8.	Pump Sta. Well.....	32000	Not present
May 12.	Pump Sta. Well.....	1300	Not present
May 12.	Tap. Schmiel Bldg...	140	Present

In every sample thus examined the water either showed an excessive number of bacteria or the presence of that type which indicates fecal pollution.

The following table shows the lengths of feet of the different sizes of pipes in the water system.

1"	1¼"	2"	3½"	4"	6"	8"	10"	12"	16"	20"
298	383	1,132	340	16,631	59,428	51,157	16,093	15,021	721	3,340

The total length of pipe is therefore 31.75 miles to be compared with 29.75 miles of streets within city limits and with 25.76 miles of sanitary sewers.

The combined capacity of the springs, which are carefully paved on the sides is somewhat more than a million gallons. The average number of gallons pumped daily during 1908 was 1,148,355 gallons, the maximum amount in September being at the rate of 1,455,310 gallons. The services are nearly all metered, 2,471 meter accounts being recorded out of a total of 2,905 in a city of 2,850 houses. A most curious anomaly in the admirable record of the sanitary conditions of this almost unique city is that in the 2,850 houses are to be found but 1,307 bath tubs, or less than one to each two houses. A campaign to instill the hygienic advantages of cleanliness would seem to be desirable. By the metered records, the average daily consumption per head is thirty-five gallons, and water seems to be freely used for sprinkling lawns, etc.

There is, in the opinion of the writer, evidence both from the character of the watershed and from the analyses quoted that the water supply is influential in causing typhoid fever. It may also be noted that the springs are entirely unprotected, by fence or otherwise, and pollution might there occur. Also that steamboats on the lake are without restriction as to the disposal of excreta of passengers. Also, that while unlikely, it is not impossible for the sewage of Watkins to affect the Geneva water supply under certain conditions of wind and currents. It is possible that the highest typhoid rates and the occasional high value of those rates may have been due to unclean milk. It seems to the writer, however, that under the present conditions existing on the watershed of Seneca lake and in the vicinity of the springs that occasional mild epidemics of typhoid fever may reasonably be expected.

Summary

1. Geneva is essentially a residential community, the manufacturing establishments requiring generally a skilled grade of operators.

2. The proportion of residents of foreign parentage is small, estimated to be about 10 per cent.

3. The general death rate in Geneva is 14.6 per 1,000, for the nine years 1900–1908, which is 1.6 lower than in sixty-three other cities of the same size in the United States and 3.5 lower than the average for the five-year period 1903–1907 in New York State.

4. The typhoid fever death rate for the nine years 1900–1908 is 28.9 per 100,000 population, reaching 52.0 in 1903. This is double a reasonable and satisfactory rate and should be a cause for alarm among those responsible for the health of the community.

5. The death rate of children under five is unusually low, whether compared with the local population or with the total number of deaths, and suggests that the number of children in Geneva is below the normal. This may also account, in part, at least, for the low general death rate. Unfortunately no data is available to the writer by which to check this probability, or to make the necessary corrections.

6. The milk supply is periodically inspected, is under careful supervision, and since 1907 may be said to be under proper control.

7. The method of garbage collection and disposal is most primitive and unsatisfactory, and should be subject to municipal direction. There is no evidence, however, that the present method is responsible for more than individual inconvenience and nuisance.

8. The sewerage system is most complete so far as distribution is concerned and the present method of disposal into the lake is without any apparent nuisance. The city, in time, for its own healthfulness and for the sake of other cities down stream on the watershed will, it is to be hoped, take in hand the problem of at least removing the grossest solids from the sewage before it is discharged into the lake.

9. The pavements of Geneva are extensive, in good condition and well kept. About half of the total mileage of streets in the city are paved and much credit is due for the rational and persistent way in which the paving has been steadily carried on for the past five years.

10. The ice supply of Geneva is cut from Cayuga and Keuka lakes, both admirable sources, and assuring ice free from pollution.

11. The water supply for Geneva comes from Seneca lake, at a point about three miles south of the city. Certain springs formerly used for the water supply are so connected as to act as pressure regulators but apparently most of the water comes from the lake. This is subject to pollution in large quantities at Willard and at Watkins and in small quantities at many other places. The springs are open and unprotected even by a fence.

Conclusions

The writer is brought to the conclusion, after his personal visit to Geneva, after a tabulation of the mortality statistics and a careful study of the same, that Geneva is an unusually healthy city, with a marked high standard of civic responsibility on the part of the public officials. He believes, however, that in the matter of garbage collection and disposal and in the matter of water supply, certain betterments may be made.

In the case of garbage disposal much greater economy and convenience should be secured by making the collection by city employees, ensuring regularly a thorough and complete removal of all organic matter, not possible under present conditions, and disposing of the objectionable material either by burying or by burning as may seem best.

In the case of the water supply, the writer believes that the water supply can be made permanently safe only by some method of purification, the conditions for which, it may be remarked, being unusually favorable, in so far as economy is concerned.

Respectfully submitted,

H. N. OGDEN,
Special Assistant Engineer

HORNELL

ITHACA, N. Y., *October* 17, 1909.

Mr. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— In accordance with your instructions, I beg to submit herewith a report covering my investigations of the sanitary condition of the city of Hornell.

History

The valley of the Canisteo river, in which the city of Hornell lies, was first settled in 1790 by a small group of pioneers who were impressed with the agricultural possibilities of this fertile region. Benjamin Crosby acquired in that year about 1,600 acres, including the site of the present city and built a cabin where the present Hotel Osborn now stands. Two years later, Judge Hornell made a small clearing at the upper end of Main street and soon became the leading man of the valley.

However, the growth of the village during this early period was not rapid and until the year 1809 there were only about seven or eight houses all told. The opening of the turnpike from Ithaca to Olean in this year gave an impetus to local growth, and about the same time transports and arks, so-called, began carrying grain and other products of the region by water to Baltimore and other available markets. This trade led to the construction of several warehouses along the river front.

In the year 1823 there were 11 houses on the village site including the mill, and it was not until that period between 1820 and 1850 that the village began to develop in real earnest, marking this the period of greatest growth and prosperity in the early history of the village. It was in 1832 that the town authorities purchased from Major Thomas Bennett two and three-quarter acres of land on the south side of Main street for the purpose of a public square, and this was the origin and inception of Hornell's present beautiful park, which is to-day the most attractive spot within the city limits.

About the year 1830 rumors became current that a railroad was about to be built and was to pass through this region, and within the next year or two surveyors appeared in the "valley," naturally arousing much excitement. Work on the road was not commenced in this vicinity until 1841 and the road was not actually in operation until September 1850, but the eagerness with which it was anticipated and the preparations made to take advantage of its transportation facilities, attracted settlers and kept building operations continually in progress. The road then built was what is now termed the Salamanca or Western Division of the New York, Lake Erie and Western railroad. In April, 1851, the name was changed to Buffalo and New York Central railroad, and still later the company became merged in the present Erie system.

The mere building of the railroad through the village, however, was not the factor that contributed most to its welfare. The greatest benefit was really derived through the establishment of a division terminus at Hornell, and also the erection of shops for purposes of construction and repairs to railroad equipment.

During the fall of 1887 another road was completed, which ran through Hornell, namely the Central New York and Western, first known as the Rochester, Hornellsville and Lackawanna Company. Recently the name has been changed to Pittsburg, Shawmut and Northern railroad. This road connects with the Delaware, Lackawanna and Western at Wayland, thus affording direct connection with Rochester on the west and other important points on the east.

Soon after the completion of the first railroad the leading citizens began to discuss the question of incorporation, and in June 1852, the "Village of Hornellsville" became an incorporated community. In the course of the next five years, however, the growth in population and the increase in local business demanded that more power be given the municipal government, and recourse to the Legislature was followed, in 1867, by the granting of this increased power, although it was not until twenty-one years later, namely in 1888, that an act was passed incorporating the "City of Hornellsville."

The city to-day, with its population of about 14,000 is one of the prominent cities of the southern tier. It has a number of flourishing industries besides the Erie shops, and is making rapid strides in the matter of permanent municipal improvements. It is just awakening to the needs of a modern city, not only in such things as pavements, sewers, etc., but also in showing interest in the sanitary needs of a large community. It is safe to say that Hornell will develop rapidly in the near future, and will provide for herself as fast as city finances will allow, those modern requirements for modern municipal living now considered necessary.

Topography

Hornell is situated in Steuben county, on the west bank of the Canisteo river, about twenty-five miles north of the Pennsylvania state line, about sixty miles due south of Rochester, and seventy-five miles southeast of Buffalo. The city itself is about one and three quarter miles north and south, by one and one-quarter miles east and west, and is well built up over the greater part of the area. The river, which really incloses the city on three sides, is a small and insignificant stream at times of low water, flowing at a rate of barely ten cubic feet per second. In the spring, and after heavy rains, the river rises with almost incredible rapidity with occasional floods of 15,000 cubic feet per second. The valley in which the city lies is narrow, from 2,000 to 6,000 feet wide, and the Canisteo has frequent tributaries from lateral valleys. These lateral streams are torrential in character, while the river itself from Hornell upstream has a good slope of ten feet per mile. Below Hornell, however, the slope is decreased to two feet per mile and the stream winds back and forth across the valley, frequently overflowing the banks, and often flooding the streets of Canisteo, five miles down stream. In order to protect herself Hornell has built a large amount of retaining wall and dyke, and the farmers just below the city have in some cases dyked their gardens to protect them against floods. The soil is gravelly and the ground water level, due to the fluctuation of the river levels, makes the use of wells particularly undesirable.

There are three tributaries which enter the river within the city limits, viz.: the Canacadea river in the northern part, by the fair grounds, Crosby creek in the southern part, both these entering from the west, and the Chauncey river entering midway between the other two from the east. On the latter stream are located the slaughter houses and pig pens of the city. The general elevation of the city is 1,160 feet above sea-level, while the hills on both sides of the valley rise to about 1,800 feet. The grades in the city, however, are very flat, and a satisfactory design of sewers and street grades is difficult on this account. However, this will be referred to later.

Industries

In population the city of Hornell is twenty-third in rank in the State, but in manufactures its rank in only forty-third. This is further borne out by the following table:

Cities.	Pop.	Est.	Capital	Wage earners	Value of products
Glens Falls.........	12,613	162	$4,474,907	3,280	$4,571,253
Dunkirk	11,616	86	4,226,495	2,615	5,393,053
Corning	11,061	138	2,212,109	1,965	3,061,172
Lansingburg	12,595	127	2,957,650	2,940	3,778,277
Ogdensburg	12,633	197	1,855,116	1,052	2,668,952
Saratoga Springs ...	12,409	170	1,863,526	939	2,006,259
Hornell	11,918	154	1,952,072	1,757	2,873,670

As will be seen from this table, there are six other cities in New York State of about the same size, and the average capital employed in these seven cities is $2,791,697 whereas the capital employed at Hornell is only $1,952,072. Or, if we take the number of wage earners and the value of products for these seven cities, we find that the average number of wage earners is 2,078, and the average value of products $3,478,948, as against 757 wage earners in Hornell and $2,873,670 as the value of annual products. Hence the ten points difference between the rank in population and the rank in manufacturing given in the United States census report for 1900 are thus corroborated, and one must conclude that Hornell is in manufacturing quite below the average for cities of its size in the State.

This has a direct bearing upon the death rates, since it is reasonable to assume that the wage earners in a large manufacturing community are concentrated among the lower classes and if the proportion of wage earners is low, the consequent small proportion of the lower classes ought to make the death rates lower than they would otherwise be,— provided we grant that the upper classes live in a more sanitary, healthful way than the lower classes. The Hon. R. N. Prangen, the mayor of the city, however, gave it as his estimate that there were at least 3,000 wage earners in the city at the present day, and if this is a true estimate, the number of wage earners has increased at such a rate during the last ten years as to make the above conclusions, which held for 1900, no longer true. However, for purposes of comparison, we are obliged to use the figures of the United States census for 1900, since it is impossible to say at this time whether the other six cities of the list have or have not advanced at a corresponding rate.

According to the reports of the 1900 census the number of establishments in Hornell were 154, but the population of the city is too small for it to be included among those cities for which the principal industries are given.

According to Mayor Prangen, however, the principal manufacturing establishments at the present day are as follows: J. Kayser & Co., Merrell Silk Co., Huguet Silk Co., Steuben Silk Mill, Underwear Manufacturing Co., Hollow Cable Mfg. Co., Davis

Co., McConnell Mfg. Co., Wood, Erie Shops and Yards, Schwartzenbach Brewing Co.

According to the 1900 census there were 436 women and children employed in Hornell. This is a proportion of 3.8 per cent. of the total population, whereas in the United States as a whole the proportion is only 1.58, which, when we consider the fact that the great proportion of the population of the United States is massed in the cities, leads us to believe that the number of women and children employed in Hornell is above the average, and the fact that there are a large number of silk mills in the city emphasizes also the same point. This leads us to the next step, namely, that the employment of a large number of women and children, affecting, as it does, the health of the children directly and indirectly, should normally increase the death rate of children. It is undoubtedly true that the offspring must suffer where mothers are compelled to work long hours each day in ill-ventilated insanitary workshops such as silk and clothing factories.

Sociology

Turning now to the study of the sociological conditions existing in Hornell we note one particularly significant fact, namely, that the average number of persons per family, among the 3,028 families in the population of 11,918, is only 3.9, whereas the average number of persons per family in the United States is 4.7. Here, immediately, is seen a factor which would tend to offset the effect on the death rates produced by the above-mentioned large proportion of women and children employed in manufacturing. This is further shown by the following table, which gives the number of persons per family for seven New York State cities of about the same size including Hornell.

Cities	Population	Families	Persons per family
Corning	11,061	2,567	4.3
Dunkirk	11,616	2,490	4.7
Glens Falls	12,613	2,824	4.5
Hornell	11,918	2,970	3.9
Lansingburg	12,595	3,077	4.1
Ogdensburg	12,633	2,872	4.4
Saratoga Springs	12,409	3,047	4.1
Average	....	....	4.3

From this we see that although the number of persons per family in most of the cities of this size in New York State is small compared with the average number in the United States, yet the average number in Hornell is even smaller than in any of the other six in this list. This is presumptive evidence that the number of children in Hornell is abnormally small.

The number of dwellings is 2,726, making for a population of 11,918 an average number of persons per dwelling of 4.4. In the United States as a whole, according to the 1900 census, the number of persons per dwelling was 5.3, showing that in Hornell the number of persons per dwelling is small. The number of families per dwelling is 1.1, also a small figure.

In Hornell there were, in 1900, 10,688 native born and 1,230 foreign born, population, a ratio of 11.5 per cent. foreign born. In the whole United States there were 65,843,302 native born population and 10,460,085 foreign born population, a ratio of 15.9 per cent. This corroborates the earlier conclusion in regard to the small number of wage earners, namely, that the lower class population is a relatively small proportion of the whole.

Mortality Statistics

The general death rate of Hornell shows an average value of 14.4 per 1,000 population, as will be seen by the following table:

Year	Population	Deaths	Rate per M
1900	11,918	165	13.8
1901	12,187	174	14.3
1902	12,455	154	12.4
1903	12,723	191	15.0
1904	12,991	204	16.6
1905	13,259	202	15.2
1906	13,527	189	14.0
1907	13,795	184	13.3
1908	14,063	209	14.9

That this is a low general death rate will be seen by comparison with the following table giving general death rates in a number of countries for the period 1901–1905:

United States registration States	15.9
Norway	14.5
Sweden	15.5

England and Wales	16.0
Switzerland	17.7
France	19.6
Germany	19.9
Italy	21.8
Austria	24.1
Spain	26.1

This table shows that the rate prevalent in Hornell, namely, 14.4 is lower than for any country on this list, a fact on which Hornell may justly pride herself.

If we take into consideration, however, the fact that the number of foreign workmen is low, and the additional fact that the number of children is very low, this rate of 14.4 must seem somewhat deceptive, although it is very doubtful if the rate of 14.4 could be raised to such an amount as would prove alarming even by the proper corrections for the above conditions.

The general appearance of Hornell, the character of its population and the type of its residences are not such as to justify so low a rate as 14.4 and the fact that the number of children is abnormally low probably is an important factor in misleading general death rate.

In 1905 and 1906 the birth rate was 17.8 and 20.8 respectively, while for the State in 1906, the rate was 22.2 and for Massachusetts, a distinctly manufacturing state, 25.3. The marriage rate, i. e., the number of marriages per 1,000 persons in Hornell is also low — 13.2 in 1906, while the rate for the State is 22.6 and for Steuben county, 23.8. The inference, therefore, is unmistakable, that either on account of the number of female operatives in the mill, or for some other reason, the number of marriages and births, and therefore, the number of children is abnormally small, thereby invalidating the usual conclusions as to the healthfulness of the place, usually based on a low general death rate. There is another factor which always enters in any collection of vital statistics to a greater or less degree, viz., the accuracy of the death record. It should not be possible for burials to occur in Hornell without the fact of the death being filed with the proper authority. And yet the low death rate suggests that an occasional death may go unrecorded. Such a failure to report deaths on the part of the physician and undertaker throws doubt on the vital statistics and invalidates all inferences to be drawn from them and it is earnestly to be hoped that if there have been any delinquencies in the past, that in the future, for the sake of the reputation of the city neglect in this matter will not exist. The reporting of contagious diseases to the health officer is another duty incumbent on all physicians which may have been slighted in the past but should be equally binding on all city physicians, since only by the prompt reporting of such cases can an epidemic be arrested before it has assumed serious proportions.

Turning now to the deaths from typhoid fever, we have the following table taken from the Reports of the New York State Department of Health:

Year	Population	Typhoid deaths	Rate per 100,000
1900	11,918	3	25.2
1901	12,187	4	32.8
1902	12,455	4	32.1
1903	12,723	7	55.0
1904	12,991	1	7.7
1905	13,259	4	30.2
1906	13,527	1	7.4
1907	13,795	1	7.3
1908	14,063	2	14.2
Average	....	....	23.5

According to this table, the average typhoid fever death rate per 100,000 population in Hornell is 23.5. This is apparently high when compared with the following table of typhoid fever death rates in other countries, although compared with the typhoid rate in the United States it is low:

TABLE SHOWING TYPHOID FEVER DEATH RATES PER 100,000 POPULATION IN THE UNITED STATES AND OTHER COUNTRIES

COUNTRY	1902	1903	1904	1905	1906	Average 1901–5
U. S. Registration, area	34.4	34.3	31.9	28.1	32.1	32.2
Australasia	20.5	25.5	15.5	13.7	15.7	19.0
Austria	18.1	19.7	19.8	......	......	19.9
Belgium	17.8	15.6	14.9	13.7	......	16.8
Germany	7.9	7.3	7.0	6.3	......	7.6
Italy	34.6	35.5	36.9	32.7	28.1	35.2
Japan	11.4	9.8	10.8	13.2	......	11.6
Spain	45.8	43.4	44.4	37.7	42.2	44.5
Sweden	10.4	5.3	5.1	......	......	8.3
Switzerland	6.0	5.0	7.7	5.0	......	6.2
England and Wales	12.6	10.0	9.3	8.9	9.2	11.2

Here it will be seen that Switzerland has the lowest typhoid fever death rate on the list, namely 6.2, or about one-fourth the rate prevalent in Hornell.

From the Hornell table, however, it will be seen that, especially within the last four or five years, there have been only such numbers as one, two, three and four deaths from typhoid fever per year. This makes it impossible to place much confidence in rates per 100,000, especially in the three years where only one death from typhoid fever was reported, since here an error of one death in reporting would either double the rate per 100,000, or wipe it out altogether. So that the most that can be said is that Hornell has had, during the period of nine years given, three or four excessive deaths per year from typhoid. Since, however, four deaths per year normally means forty cases per year, it behooves the authorities of Hornell to keep a strict and intelligent watch over the sanitary conditions of their city, and to do all in their power to stop the spasmodic fluctuations in the typhoid rate. Especially should care be exercised to secure a good quality of milk.

The following table gives the rate of deaths per 10,000 population for children under five for the same period of nine years, according to the reports of the New York State Department of Health:

Year	Population	Deaths	Rate per 10,000 pop.
1900	11,918	32	26.9
1901	12,187	34	27.9
1902	12,455	12	9.6
1903	12,723	42	33.0
1904	12,991	50	38.5
1905	13,259	31	23.4
1906	13,527	36	26.6
1907	13,795	26	18.8
1908	14,063	41	29.2
Average	....	....	26.0

This rate is low, undoubtedly, as will be seen more from the following table of corresponding rates:

Place	Population	Deaths under 5	Rate per 10,000
Registration area	41,758,037	183,774	44.0
Registration States	33,516,714	147,507	41.5
Massachusetts	3,083.013	14,620	47.4
New York	8,386,673	39,773	47.4
Pennsylvania	7,032,915	36,433	51.8

Hornell average for nine years, 26.0

It is hard to say just what this low death rate among children means. It may be that the death rate among the children is really low and that this fact, coupled with the abnormally low proportion of children, brings about the rate of 26.0 per cent., or on the other hand, the fact that the proportion of children is extremely low, may, notwithstanding an actually high rate, bring it down to 26.0. Undeniably, the rate corroborates the conclusions reached from the statistics on the number of children, but this is all that can be definitely stated.

Finally, therefore, the impression derived from a study of statistical data on death rates, is that the inhabitants of the city must be surrounded by healthful conditions, since, with the exception of a few excessive typhoid deaths per year, the death rates are low. It should be reiterated, however, that appearances do not confirm this, and there is some doubt as to the validity of the reports of the number of deaths in Hornell.

Milk Supply

The milk supply of Hornell comes from about thirty dealers, representing about twice that number of farms. One creamery distributes about 300 quarts daily, the largest amount, and twenty others distribute from 100 to 250 quarts. The other dealers, nine, handle less than 100 quarts, eight of them having only one cow each. The sanitary code of the city, in force in 1901, had a number of sections (Nos. 33-45) dealing with the quality of milk that might be delivered in Hornell and required sampling of milk, licensing of dealers, inspecting of dairies, etc., but so far as the writer has been able to learn these rules are practically all dead letters, and are not observed. In the spring of this present year, the desirability of a more effective supervision over the quality of milk was taken up by the board of health, and the rules re-enacted, with some modifications taking effect in June 1909. These rules provide for standards of composition of the milk, for clean, well ventilated stables, for certain kinds of feed, for licenses for dealers, for revoking the license after a hearing, and for the observance of certain regulations in the dairies as conditions precedent to the sale of milk in the city. These regulations are not burdensome upon the farmer, and should require little more than the exercise of care and reasonable effort on his part to secure compliance. If faithfully followed, they should result in a marked improvement in the milk supply. Unfortunately, the city has provided no adequate machinery for carrying out the provisions of the law, except for collecting the license fee, which part has been carefully done. No laboratory for testing the milk has been provided, nor any persons to do the testing, no inspector to see whether infected food is used or not, whether the milk is cooled to 60 or not, whether green corn is fed or not, and whether in general the stables are kept in sanitary condition. On July 8th, by invitation of the health board, Dr. E. M. Santee, of the Department of Agriculture, visited Hornell and inspected and scored 15 farms, from which comes, as he says, about 35 per cent. of the milk supply. Dr. Santee also held a public meeting for milk producers, and explained to them the object of the rules, and of the attempt of the board to improve the quality of the milk. As matters are at present the board has done nothing towards enforcing its rules, and no improvement in the milk supply can be looked for until a regular systematic inspection is practised. So far as death rates of children under two from diarrhea and enteritis is concerned, a consideration of which is understood to involve the quality of the milk supply, the present conditions are not objectionable. The following table shows the deaths and the death rates from this disease for eight years past:

Year	Population	Deaths	Rate per 100,000
1901	12,187	5	41.1
1902	12,455	6	48.2
1903	12,723	7	55.0
1904	12,991	6	46.2
1905	13,259	5	37.7
1906	13,527	6	44.4
1907	13,795	5	36.3
1908	14,063	8	57.0

From this table it is seen that the death rate is about 50 per 100,000 whereas the corresponding rate in the cities in registration states for the five years 1901–1905 was 135.4 and the rural part of the registration area was 75.8. Manufacturing cities with large tenement or foreign population show sad results of feeding children impure milk or water and other forms of improper nourishment. For example, the rate in Cohoes for the same period was 158.3, in Dunkirk 196.2 and in Niagara Falls 169.2. The rates in these cities are undoubtedly influenced by impure water, but it is a safe conclusion that in Hornell the remarkably low rate means both good water and good milk, although here again the small number of children affects this rate. It is most desirable that these conditions should be maintained and it is to that end that supervision over the milk supply should be exercised.

Garbage

The collection and disposal of garbage from the city of Hornell, while in some respects admirable, in others can well be improved. In the matter of collection, the city licenses certain firms who agree to carry out the provisions of an ordinance passed by the city council under date of April 3, 1908. This ordinance provides that all household garbage shall be properly cared for, and not deposited on any street, alley or other public place, and shall not be so stored on private ground as to create a nuisance. The ordinance further requires persons engaged in the business of collecting garbage to have a license from the board of health, a condition precedent to obtaining this license being that the licensee agree to furnish watertight metal cans acceptable to the board, which shall in all cases be thoroughly cleaned and disinfected after the garbage has been removed therefrom. This ordinance in effect provides two things: First, the householder is relieved by the prompt removal of all garbage from his premises; and, second, the persons removing such garbage do so only in watertight metal cans. The second part is well carried out, i. e., the garbage collectors are provided with suitable cans, which are well washed and sterilized at the place of dumping. The other part is not so satisfactorily enforced, since by the best information which the writer could secure, only about one-half of the property owners are provided with cans, and avail themselves of the services of the garbage collectors. There are two reasons for this. The ordinance requires the property holder to provide the metal cans, and since one is always away being washed while the other is in use he is obliged to provide twice as many cans as would otherwise be necessary. Then the collector charges ten cents each time a can is changed, which expense is of considerable moment to the poorer class of the community. Then, again, a number of farmers come in from the country and take away garbage for the value of the garbage without cost to the householder, but at irregular intervals. There can be no question, however, but that in the case of houses cared for by the licensed garbage collectors the clean and sterilized cans substituted for the full cans are a great improvement over the ordinary method of dumping cans into a half-full and foul-smelling garbage cart, and this installation and procedure calls for unqualified approval and might well be imitated by other cities in the State.

The collector with the greatest amount of business (Brickman) collects about 700 cans a week, and the contractor with the next largest business (Miles) collects about 500 cans a week. Three others bring the total number to perhaps 2,000 cans per week. With a population per dwelling of 3.9 this would mean only about 8,000 persons served out of a total of 14,000, not considering hotels, restaurants, etc. In some cases the collections are made more frequently than once a week. It may be pointed out here that this method of collection is expensive and that if the same work were done under municipal direction with the cost collected or assessed upon the property, the cost to the property holder would be much less than at present and would insure at the same time a complete removal of the garbage from all parts of the city, instead of neglecting, as at present, the houses which refuse to pay including those where least cleanliness exists.

The disposal of garbage is effected by feeding it to pigs, Brickman having about 220 pigs of all ages and Miles about 160. Their places are not in the city and are not therefore under the jurisdiction of the board of health, nor are they directly concerned with the health of the city. The only possible menace involved in this method of disposal lies in the fact that in some cases the pork from these swill-fed pigs is sold in the city. The food fed to the pigs is not boiled or sterilized and any infected material in the swill would thereby pass directly to the swine. In the case of trichinosis the pork or ham might readily be infected. One collector (Brickman) does not kill pigs thus fed, but ships the pigs west, and, the writer understands, buys only western hogs.

Other refuse of the city, such as paper, dead animals, night soil, etc., are hauled to the city dump, located on the John Hunt farm, south of the city, and there supposed to be buried. The writer noted some of the pits there filled to overflowing and with no pretense of burial. This was of some interest, in view of the protests made by the village of Canisteo in regard to the character of the overflow coming from Hornell in times of flood. It is to be hoped that in the course of time the city may be able to adopt the practice of municipal collection of garbage and dispose of the same in a garbage crematory. At present the efforts of the board should be directed to secure the prompt removal of all garbage from the houses, i. e., to the extension of the can collection throughout the rest of the city, and also to the enforcement of the ordinance requiring the cans to be cleaned and sterilized. In the meantime the burial of refuse in the pits should be attended to and to such a degree that there will be no chance of its being carried down stream.

Sewerage

The system of sewers in Hornell was designed on the separate plan, in 1892, by Mr. C. P. Bassett of Summit, N. J. The lines of pipe were intended to cover the whole city and to serve for

many years to come. In the seventeen years that have elapsed since construction, some defects and difficulties have appeared which call for remedy and which, as existing at present, are a source of discomfort and nuisance to the community, if not of actual danger. First, it may be noted that the main trunk sewer discharging into the river just below Crosby creek, runs full of sewage and ground water, at all times, so that no room is left for additional connections, and so that any increase in ground water at times of rain backs up the sewage and causes overflows. This condition of things is due to three things: (1) To the depth of the main sewer, in Broad street and vicinity, a depth which gives the ground water a high head on the sewer and which makes any repairs practically impossible. (2) To the porous and gravelly soil through which the sewer passes, so that the ground water enters freely from the pores of the soil into the pipe. (3) To careless inspection or improper materials or both, during construction.

The sewer discharges about 6,000,000 gallons per day, although the domestic sewage flow for 14,000 people is probably not more than one-fourth of that amount. It is fair to say that the present flow at the outfall is one part sewage and three parts water. The unfortunate results of this dilution are apparent when studies of a proper design for a disposal plant are made, the large flow requiring an extensive and costly plant, as well as requiring additional mains for laterals, which are crowded out of the present trunk. Since the original construction, one relief sewer has been built, chiefly to relieve the congestion caused by the wastes of a large mill, at the corner of Canisteo and Spruce streets. Other places need the same treatment, but the depth of the main sewer, and its distance from the low ground along the river combine to make any solution of the problem a difficult one. There are some streets in the northwestern part of the city which slope to the north, away from the present system, and it is proposed to connect the sewers for those streets, into a new trunk line to be built along the river, the whole length of the city, into which overflows or relief sewers from the present overtaxed lines, can be carried. This will undoubtedly be an expensive construction but seems to be required by the existing conditions. The sewers of the city are not at all brought into one outfall, as will be necessary for a disposal plant, but on the east side of the river there are two outfalls, at Delaware avenue and at Rockwell street. On the west side a private sewer, known as the McDougal sewer runs from Broad street to the river on Main street, with house connections and catch-basins, entirely separate from the sewer system. The proposed new trunk sewer would collect the sewer from these three existing outfalls and at the same time relieve the present main by overflows at several points. It is evident, therefore, that the sewer system requires considerable addition before it can be said to be satisfactory. As to the method of disposal the following is taken from a report of the writer, dated August 7, 1907.

"The character of the stream between Hornell and Canisteo, into which the Hornell sewage is discharged, is that of an alluvial stream, very tortuous, winding through a valley from 1,000 to 4,000 feet in width; the stream itself is generally shallow, with occasional pools between riffles, the water surface being about fifty feet in width. The ordinary channel, on account of the diminished slope between Hornell and Canisteo, and on account of the tortuous course of the stream, is not large enough for the flood flows which more than fill the banks, overflow to the bottom lands, and deposit more or less sediment thereon."

"There are in the city several manufacturing plants which discharge wastes into the river, viz., the Merrill Silk Co., Cor. of Grand & Pleasant Sts., the Huguet Silk Co. near the Cor. of Thatcher and Steuben Sts., the Steuben Silk Mill Co. at the head of Main St. and the Prindle Tannery, Cor. of Canisteo and Spruce Sts.; of these the Steuben Mill does no dyeing; the Merrill Co. and the Prindle Tannery being the factories which contribute pollution to the river. The Merrill Co. discharges into the main city sewers, the Huguet Mill has a private line to the river just outside the city limits, and the tannery discharges into a separate line of sewers emptying into the river at the foot of Delaware Avenue."

"The effect of the above discharge on the river is very evident, the color of the sewage being black or dark purple at times, changing to a lighter color at certain times of the day and then to the dark color again. The water is turbid, and carries during the day about ten times as much material as at night. There was a very perceptible odor to the stream, suggesting sewage contamination. Assuming a minimum flow of twenty cubic feet per second as indicated above, the stream should be able to assimilate, without the production of any nuisance, sewage at the rate of five cubic feet per second for each 1,000 population contributing — or for a total population of 4,000 persons. If the actual population is 6,000 with the probability of the number gradually increasing to 9,000 or 10,000, the nuisance now existing in the stream is readily accounted for. And if to the domestic sewage is added the dye stuffs and tannery wastes, the ground for the complaint is evidently well taken."

As will be seen from the above, the writer then believed that the method of disposal by direct dilution was inapplicable, causing deposits and decomposition in the river, resulting in offensive odors and spoiling the river for its natural uses, and that belief is strengthened by his present inspection. The present condition of the river constitutes a public nuisance, and calls for immediate action on the part of the city authorities. It should be added that an order was issued to the mayor of Hornell, directing him to submit plans for a suitable disposal plant by January 1, 1909, and the late Mr. Leach, city engineer, was at work on these plans at the time of his death, early in 1909. Since then the city has been without an engineer, and the plans have not been advanced. With the appointment of a new engineer on August 1st, it is to be hoped that the plans may be perfected and work commenced in the near future.

The following table shows the number of feet and the respective sizes of all the existing sanitary sewers:

6″	8″	10″	12″	15″	18″	20″	24″	Total
823	67,416	7,125	4,570	2,677	2,671	2,739	4,034	92,055

As per the above table the total is 92,055 feet or 17.43 miles out of about thirty miles of street. The map attached shows the location and the size of the sewers on the city streets.

Besides the sanitary sewers there are about three miles of stor sewers with 154 catch basins, to carry off the rain water from th streets. The following table shows the number of feet each size

8"	10"	12"	15"	18"	20"	24"	30"	33"	36"	40"	42"
710	150	858	745	2,190	475	3,826	3,100	1,520	102	1,150	1,12

Pavements

The paved streets of Hornell are either brick or macadam and i some instances are old and decidedly out of repair. The bri pavements, especially, are characterized by three or four lo tudinal cracks extending from five to twenty feet, and each tinuing on an offset another similar distance and so on throug length of a block. This is particularly noticeable on Main str and on Canisteo street. A large number of depressions, som patched and some not, are noticeable, so that while the surface c the street is not particularly uneven, it is badly broken and wi undoubtedly continue to deteriorate. Some of the brick pavemen put down in recent years (about three-fourths of a mile built i 1908), is in good condition, but the larger part is as describe above. There are about 3.94 miles of brick pavement, and 2. miles of macadam, the latter being old and in bad condition, e cept in a few streets. A large amount of labor is expended an nually in clearing and grading the unpaved streets, representin a large annual outlay, which will continue until some permanen pavement is laid. The pavements are flushed by a stream from watering cart with air pump attachment for securing pressure The nozzles, one on each side, are on the form of a slot abou 6 inches long by ¼-inch wide, so that a stream can be delivered i a continuous line on the pavement. As the cart moves, the di of the street is washed into the gutters, and thence into the stor sewers. Except that the amount of water is large, this metho gives full satisfaction to the officials of the city, and has entirel supplanted the street sweeper used up to a year ago. The cart i used daily when the weather permits, and one cart and a hal dozen men are needed to scrape up the coarse material on th street as well as to clean out the gutters, which sometimes becom

clogged. Practically nothing is done on the macadam streets except a little cleaning up in the spring, the entire cost of this work in 1908 being $54.31, or about $25.00 a mile a year. The appearance of the paved streets, at the time of the writer's visit, so far as cleanliness is concerned, was admirable, and, since it is said to be much cheaper than sweeping, it will probably continue to be used. The effect on the brick if filled with cement or pitch, is said to be negligible.

Ice

The ice supply of Hornell is practically all in the control of Prangen Bros., who have a large ice pond formed artificially just at the edge of the city on Canacadea creek. The stream flows through the small hamlet of Almond, about four miles away, and runs through agricultural country, but the proprietors showed an evident desire to maintain the purity of the water and claimed freedom from all direct pollution on the watershed. About 7,000 tons are cut annually. It is recommended, however, that the water of the creek be analyzed to better determine its quality.

Water

The water supply of Hornell comes from a small stream northwest of the city known as Seeley creek. This creek rises in the town of Fremont, and flows into the Canisteo river about two miles north of the city of Hornell. A reservoir on this creek has capacity of about forty million gallons and furnished storage for dry weather flow. The dry weather flow is probably about one cubic foot per second, while the consumption is about double this amount. Greater storage area is urgently needed and plans are now in preparation either for additional reservoirs or for increasing the size of the present reservoir by raising the dam. From the reservoir two castiron pipes, one sixteen inches and one twenty inches in diameter run to the filter plant, a distance of two miles, where pressure filters of the Hyatt type are installed. This plant is located on the edge of the Canisteo valley on a hill 200 feet above the city, and on the bank of the same stream which furnished the water. At the time of the writer's visit, although no

water was escaping from the reservoir, and the wate was five feet below the waste weir, there was a small stream, and the water company had installed a Worthi to lift the additional water to the filters. The follo running in the daily papers at the time of the writer' indicates the lack of water.

WATER CONSUMERS

Owing to the extreme dry season it becomes neces tion our water consumers. We are in no danger if ou will keep their water fixtures in proper condition; s and closets are not leaking, and be careful in usin sprinkling.

I wish at this time to notify all those who are sprays, especially those who are allowing them to run some all night, also those who continually soak the using hose, that this practice must be discontinued.

WATER DEPARTME
By Wm. E.
Sup

Approved:

A. F. BANNON, Jr.,
Superintendent of Public Works

The filter plant consists of five horizontal cylindrical filters about six feet diameter and twenty feet long. (sulphate of alumina) said to vary in strength from 0 per gallon is continually pumped by automatic pum raw water pipe. This water flows through the filt collected at the bottom and led to the city by a 16-inch following summary of Professor Chamot shows his opi sanitary value of these filters. "The efficiency of tl probably very low. Raw water has been turned into tl past years at times." In the city the pipes are laid in t of the streets, as shown by the plan appended. In a streets there have been laid pipes of less than four inch the smallest shown on the map, i. e., two inches and o eighth inches, to supply water for domestic purposes, course, useless for fires. The superintendent is anxio

new twenty inch line, from the filter to the city, in order that an accident to the present line may not leave the city without water. Additions are being continually made to the city water mains, partly to extend the lines into newly built up territory, and partly to replace lines of insufficient size. The writer feels that the distribution system, so far as the domestic needs are concerned, is in good condition, and that, with the proposed storage reservoir a reality, the matter of quantity need no longer cause anxiety. So far as quality is concerned, he has not the same assurance. The creek flows through an agricultural community, with no village on its banks, and with not more than forty to fifty persons per square mile of watershed. The water board has recently purchased a mill property and water rights, partly for storage, but chiefly to do away with an offensive barn yard and chicken run, just above the reservoir and directly on the bank of the stream. It has also purchased a farm which had an objectionable barn. But farther upstream noregular and periodic inspection is practiced and it may easily be possible for pollution to enter the stream. In fact, the installation of the filter plant was directly due to an epidemic of typhoid fever in the city, caused, it was said, by a single case of disease on the watershed, the wastes of the patient having been thrown out on the steep slope just above the creek, and so washed into the reservoir. It is certainly a wise precaution to avoid the possibility of such pollution as far as possible, and by means of a patrol and rules protecting the purity of the water to leave as little as possible for the filters to accomplish in the way of removing pathogenic germs. The writer recommends, therefore, that the water board of Hornell apply to the State Department of Health for the enactment of rules suitable for the protection of the watershed, and for ensuring an unpolluted water, and that an inspector be appointed to make regular visits on the watershed to see that the rules are enforced. The following analysis of the State Department of Health shows that the water was organically polluted, both ammonias and nitrates being high. It is of interest, also to note the positive results of the tests for B. Coli Communis, and that on both dates the effect of the filtration on the number of bacteria was practically nil.

TABLE SHOWING ANALYSIS OF CITY WATER, HORNELL, N. Y.

	January 18, 1909.		February 19, 1909.	
	Raw.	Fil.	Raw.	Fil.
Color	4	......	trace	trace
Odor	musty	......	musty	musty
Turbidity	6	......	30	clear
Solids	93	......	73	75
Loss on ignition	27	......	22	20
Mineral residue	66	......	51	55
Free am	.024	......	.012	.002
Alb. am	.080	......	.068	.028
Nitrites	.002	......	.003	.001
Nitrates	1.30	......	0.90	1.10
Hardness	48.6	......	41.6	50.7
Bac.	750	800 1,000	11.500	8,000
B. col. com. pres.	1 c. c.	Pres.	Pres. 1/9 (1 c. c.) 1/3 (1/10 c. c.)	1/3 (.10 c. c.)
Oxygen consumed	2.55	......	3.55	1.15
Chlorine	1.50	......	1.37	1.50

Summary

1. Hornell is essentially a railroad town, being a division and junction point for the Erie railroad. There are several silk mills giving employment to nearly 500 women and children.

2. The proportion of foreign born citizens is small (11.5 per cent.), and shows that the larger part of the population is native American. The number of persons per family is very small (3.9), indicating a large number of unmarried persons and a small number of children per family.

3. The general death rate per 1,000 population in Hornell is 14.4 for the past five years. This is 1.5 lower than the five year average (1901–1905) for the whole United States, and on its face is highly satisfactory. The low rate is, however, caused, in part at least by two factors, viz.: the small proportion of foreigners in the population and by the small number of children, in both of which classes the death rate is high. Figures are not available by which to make corrections for these factors, but it is probable that the corrected rate would still be low.

4. The typhoid fever death rate is generally low, the average for the past three years being below ten per 100,000 population. In 1903 the rate was fifty-five, so that the recent efforts of the water

board to provide pure water are evidently meeting with success. Continued vigilance is, however, always necessary.

5. The death rate of children under five is abnormally low, and is undoubtedly affected by the small number of children, the exact effect of which in value of lack of numerical data, cannot be exactly expressed.

6. The milk supply is apparently not responsible for excessive sickness in Hornell, although this is not the result of any supervision on the part of the health authorities. No systematic inspection of farms or analysis of milk is practiced, and it is much to be hoped that the local board of health will institute a system of dairy inspection and milk sampling by which the good quality of the milk may be continued.

7. The method of garbage collection, so far as it extends, is admirable and a model for other cities of the State. Unfortunately, it applies only to those houses willing to pay for it, and this means that more than half the city dispose of their garbage irregularly and under pressure of necessity. The garbage is in general fed to hogs, kept in large numbers for this purpose on the outskirts of the city.

8. The sewerage system is in immediate need of extension, and a sewage disposal plant should be built at once. Plans for the latter are nearly completed and the city engineer is preparing plans for the necessary extensions.

9. The pavements of Hornell, as existing at present show signs of deterioration, except in those recently built. The length of paved streets is small, 3.94 miles, and it may confidently be expected that in the near future Hornell will add considerably to its present mileage of pavements.

10. The ice supply of Hornell comes from an artificial pond on the Canacadea creek, and has every physical appearance of being free from pollution.

11. The water supply comes from a small creek to the northwest of the city, and is an average quality of surface water. A storage reservoir of 40,000,000 gallons capacity and a battery of five pressure filters reduces the amount of suspended matter naturally present in the water. In view of the character of the filters, it is suggested that water rules be formulated for the protection of the

watershed and that the water board add to the highly commendable efforts already made to keep the watershed clean; the further protection which will come from a regular systematic inspection of the watershed for the purpose of enforcing such rules.

Conclusions

The writer is brought to the conclusion after his personal visit to Hornell, after a tabulation of the mortality statistics and a careful study of the same, that Hornell is a normally healthy city and free from any excess of diseases due to municipal carelessness and neglect in sanitary matters.

In order that this happy condition may continue and that no epidemic disease may break out, the writer suggests the following precautionary measures.

1. The milk supply should be brought under more direct control and should be subject to inspection both at the dairies and as delivered from the wagons.
2. The garbage collection should be extended so as to include every house in the city, and it should be the ideal of the city authorities to have the collection made under municipal direction instead of by private parties as at present. Supervision over the piggeries should be exercised at least so far as may be necessary to prevent diseased pork, etc., being sold in the city.
3. The necessary extensions of the sewerage system should be made and the construction of the sewage disposal plant proceeded with.
4. The establishment of water rules should be asked for and an inspector appointed to patrol the watershed and prevent all contamination of the water in its upper reaches.

Respectfully submitted,

H. N. OGDEN,
Special Assistant Engineer

ITHACA

ITHACA, N. Y., *November* 15, 1909.

MR. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— In accordance with your instructions, I beg to submit herewith a report covering my investigation of the sanitary condition of the city of Ithaca.

History

The early settlement of Ithaca followed close upon the Sullivan campaign of 1779, which resulted in the practical extinction of the Cayuga Indians, who were the original owners of the valley at the head of the lake bearing their name. The earliest permanent settlers came from Kingston, N. Y., in 1789, building log cabins at the foot of East Hill and cultivating the lands already partially cleared by the Indians. Other settlers followed and in 1806 there were twelve houses, within the present city. The village was named at this time by Simeon De Witt, Surveyor-General of the State, who laid out the village and owned a large part of it, retaining a large tract for his own home site.

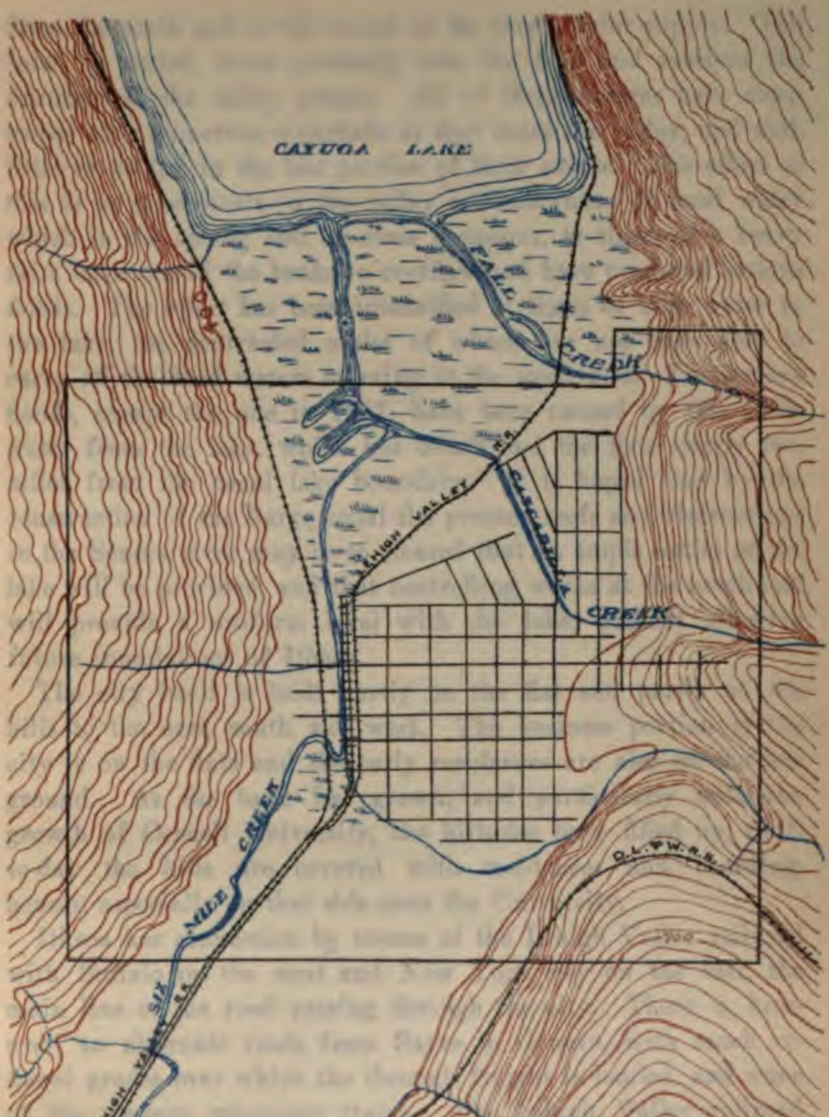
In 1810 the twelve houses had become thirty-eight, and the three-story hotel was not able to take care of its business, so great was the demand for accommodations.

The turnpike to Owego, built about this time, gave connection with the Susquehanna river and so water carriage to Pennsylvania, and large quantities of stock, grain, potash, lumber, pine-tar and lime were shipped out of or through Ithaca. On some days as many as 800 teams passed down the turnpike, each contributing its part to the growth of Ithaca. The turnpike to Catskill gave Ithaca additional impetus, the stage coaches making the trip in two days. The Erie canal, begun in 1817, gave, through the lake, direct and easy connection with the seaboard, and a remarkable development of the lake traffic followed.

By 1835, the zenith of this early prosperity, the population had reached 3,923 persons, and the early histories pointed with pride to the fact that in some days of each week fifteen mails a opened and closed, five daily stages arrive and depart; a stea boat also traverses the lake daily. A land speculation at th time swept through the village like a fever, farms a mile out the village, as well as the swamps, divided up into small lots, a sold and resold at absurdly high prices. Following this came t reaction, when the best citizens were ruined financially, all loc interests suffered, and for a decade it seemed as if the villa might not recover. But the fertility of the surrounding count and the natural advantages for communication slowly had the effects and though the growth was slow the village finally r covered and even forged ahead. The great flood of 1857 memorable in that it caused destruction of both life and propert and only in 1908, fifty-one years later, has the municipali taken active steps to prevent a similar catastrophe. In 18 Cornell University opened its doors, an event which doubtle has been the most significant fact in the history of the town, sin it is as the seat of Cornell University that Ithaca is best know From the small beginning with a few underpaid professors a one building, this institution has grown until to-day it ran among the leaders in educational work of the world. It has abo 4,000 regularly enrolled students, with another 1,000 enrolled i the summer session and in special agricultural courses.

Topography

The city of Ithaca lies on an alluvial plain at the head Cayuga lake, and about a mile distant from the present water edge. This plain is about a mile wide between the hills whic skirt the lake on either side and which rise to a height of abo a thousand feet above the water level. The valley extendin southerly from the lake, arises gradually for about four mile then, contracting, rises rapidly to a continental divide about si miles south of the city. There are four main streams whic enter the lake at the south end and which pass through the cit Fall creek, with a drainage area of about fifty square miles an a length of about twenty miles, empties into the lake at the sout east corner. Cascadilla creek, about half a mile south, joi Fall creek as it enters the lake. Six Mile creek enters the la



Map of Ithaca Showing Topography and Railroad Connections.

from the south and is the source of the city's water supply. The inlet, so called, flows northerly into the lake and receives the drainage of the valley proper. All of these streams have steep slopes with numerous waterfalls as they enter the valley, and with little or no fall in the last portion of their course. The effect of this is to concentrate in the valley accumulations of flood water which in the spring and on some occasions, at times of a heavy rain, have caused the banks to overflow and have produced serious floods. The effect has been intensified at times of high water in the lake, the contracted outlet of which has not been able to carry off the flood waters entering at the south end. The serious floods, except the one in 1857, have been caused by this backwater from the lake, which has overflowed the flats nearly two miles from the usual lake boundary. It is hoped that by the construction of the Barge canal the present reefs and obstructions in the Seneca river may be so cleared that an ample outlet of the lake will be provided, and that controlling works at the north end will provide a uniform level with the lake, without allowing future inundations of Ithaca.

The city itself is built partly on the flat and partly on the hills to the east, south and west. The business portion of the city is on the flats and the early residences are also on the low ground. As the town has grown, and particularly with the growth of Cornell University, the hillsides have filled up, until to-day the hills are covered with residences and boarding-houses, especially on that side near the University.

Ithaca has connection by means of the Lehigh Valley railroad with Buffalo on the west and New York city on the east, the main line of the road passing through the city. There is, however, an alternate route from Sayre to Geneva, with much reduced grades over which the through freight is hauled, and some of the western passenger trains. The Lehigh Valley railroad also has a branch line running from Ithaca to Auburn, and Ithaca is also a station on another branch running from Elmira to Canastota, connecting at Freeville with still another branch running from Sayre to Auburn. The D., L. & W. railroad has a spur running from its main line at Owego, so that thereby direct connection is had with New York and Buffalo. A trolley connects Ithaca with Auburn directly, and other trolley lines are proposed to Cortland and to Elmira.

The torrential character of the streams entering the lake, in spite of the large falls available, preclude any extended water power development. On Fall creek the University develops about 500 horse power, used in connection with University work. Below the University plant are some half dozen water-rights, which are used at portions of the year, and at others supplemented by steam. The Ithaca gun factory, the Ithaca Paper Company and the Fall creek flour mills are on this stream. Cascadilla creek has so small a flow of water that the earlier mills on this stream have been given up, although here was the first mill ever established in Ithaca. On Six Mile creek the Water Works Company maintained a dam and does some of the necessary pumping by water power. The other factories in Ithaca use steam entirely. The feature of the Ithaca location is the charm and beauty of the scenery as viewed from the hilltops on either the east or the west side of the valley. During the past ten years a marked suburban development has taken place to the northeast of the city, and the many knolls which crown the hillside furnish picturesque sights overlooking the lake, each with its peculiar vista.

Industries

Ithaca is not a manufacturing city, although the efforts of the Business Men's Association are constantly directed toward inducing outside manufacturers to locate in Ithaca. The two most important factories are the Ithaca gun works, employing about 100 skilled mechanics, and the Morse chain works, employing about the same number. There are small mills, making paper, a factory which makes signs and advertising novelties, and an establishment for building incubators and portable houses, but as a manufacturing city Ithaca ranks only forty, although in population it ranks thirty-one. The character of the industries that exist are such as to have a good rather than a bad effect upon the health of the city, since the operatives are all skilled, generally American, and except for a small community of foreigners maintained on the outskirts by an Italian contractor, there is no opportunity of employing foreign labor.

Sociology

The absence of manufacturing and the presence of the University give peculiar characteristics to the social conditions of the city. The population on the flats is employed in the business of the city with no tenement-house districts and, except for a few huts over from the time of the canal industry, there is no part of the city where markedly poor housing conditions obtain. Near the University the presence of large boarding-houses provides rooming facilities for the many students who make Ithaca their home nine months in the year. The native population has the same characteristics as other cities of Central New York, intensified, perhaps, by the resident members of the University, some 1,500 in number. The number of persons of advanced age is large, the number of children is small and the general interest in municipal improvements and in sanitary measures is high. The desire on the part of the citizens to maintain conditions in the city such that it may be attractive as a place of residence to students, and that the health conditions of the city may not jeopardize the success of the University, leads to large expenditures for city purposes, and the city may be expected, therefore, to show almost ideal conditions, so far as the health of the community is concerned.

Mortality Statistics

The city of Ithaca had an average general death rate of 15.8 for the period of years 1900–1908, as computed from figures in the following table, the populations in which have been interpolated between the figures of the census report of the United States for 1900 and the State census of 1905, and the number of deaths taken from the annual reports of the New York State Department of Health.

Year	Population	General deaths	Rate
1900	13, 136	218	16.6
1901	13, 432	214	15.9
1902	13, 728	192	14.0
1903	14, 024	269	19.2
1904	14, 319	228	15.9
1905	14, 615	209	14.3
1906	14, 911	207	13.9
1907	15, 207	242	15.9
1908	15, 503	249	16.1

Average, 15.8.

That this general death rate of 15.8 is about normal will be seen by comparison with the following table of general death rates in a number of the leading countries in the world: (Page 211, Report on Vital Statistics of New York State, by Walter F. Willcox, Consulting Statistician.)

	1901-1905		1901-1905
Norway	**14.5**	**Belgium**	**17.1**
Denmark	**14.8**	**Servia**	**22.4**
Sweden	**15.5**	**Bulgaria**	**22.9**
Netherlands	**16.0**	**Austria**	**24.1**
England and Wales	**16.0**	**Roumania**	**25.5**
Scotland	**16.9**	**Spain**	**26.1**
New York	**17.1**	**Hungary**	**26.2**
France	**19.6**	**Ireland**	**17.6**
Germany	**19.9**	**Switzerland**	**17.7**
Italy	**21.8**	**Finland**	**18.6**

From this table, Norway, Denmark and Sweden are the only countries which have lower general death rates, Norway having a death rate 1.3 lower than Ithaca, and Sweden a rate 0.3 lower than Ithaca. Both of these countries have the favorable, health-promoting, northern climate, which is much more likely to produce a stern, hardy race of men than the more treacherous, though lenient, southern climate. If, however, we deduct from the general deaths for 1903 those incurred by the typhoid fever epidemic, and then strike an average for the same period of years, we will find that the above general average death rate will be reduced to 15.4, thus even going below Norway. It is, therefore, reasonable to assume that Ithaca has a general death rate which is normal, when compared with rates in other countries. Compared with cities of other states (page 29 of the Mortality Statistics of 1907, United States Census Bureau) in this country, this is even below normal, except for Michigan and Indiana.

California	21.9	New Hampshire	17.0
Colorado	22.3	New Jersey	17.9
Connecticut	16.4	New York	18.1
Indiana	14.8	Pennsylvania	17.8
Maine	18.5	Rhode Island	17.9
Maryland	20.0	South Dakota	11.8
Massachusetts	16.9	Vermont	17.1
Michigan	14.6		

It is in marked contrast with the annual average rate for New York State, which is 18.1 for the years 1901 to 1905 and 18.2 for 1907. If the excessive rate for 1903, the year of the typhoid epidemic, be eliminated, the average general death rate is but 15.4, 2.7 lower than the New York city rate. This low rate is in part due to the peculiar sociological conditions above referred to, the number of elderly adults, the small number of children and the absence of foreign population, and in part undoubtedly due to the unusual intelligence and efforts on the part of the municipal authorities, to preserve the reputation of the city in all matters of public health.

In the matter of typhoid fever, previous to the year 1903, conditions were not satisfactory, the death rate for some years reaching a rate of 50 per 100,000. The following table gives the rates since 1900, in which the rate for 1903 marks the classic epidemic, which gave 1,200 cases and 108 deaths:

Year	Deaths	Rate
1900	6	45.7
1901	1	7.4
1902	6	43.8
1903	50	357.2
1904	4	27.9
1905	2	13.7
1906	2	13.4
1907	1	6.6
1908	1	6.5

Average, 58.0.

As long ago as 1894, in a public address, one of the members of the faculty called attention to the prevailing high rate of typhoid fever and to the danger to be apprehended if steps were not taken for its control. The actual epidemic was due to the pollution of the water supply of the city at the time of the construction of a dam on the creek furnishing the water supply, about half a mile above the intake. A filter plant was immediately installed, and since 1903 the average rate has been
with a rate of less than ten the last two years. It
that this rate will be much exceeded in the futur
ing the summer of 1909 a polluted milk sup

sixty-four cases of typhoid, with two deaths up t
time.

The deaths under five are low, as shown by the rat
population and by the ratio of deaths under five tc
These are not significant figures, however, in view
number of children in the city and the absence of th
ulation. The table of death rates under five follow

Year	Deaths	Rate	Popula
1900	30	22.9	13,
1901	36	26.9	13,
1902	24	17.5	13,
1903	30	21.4	14,
1904	32	22.4	14,
1905	23	15.8	14,
1906	25	16.8	14,
1907	38	25.0	15,
1908	49	32.6	15,

Average, under five, 22.4.
Ratio under five to general deaths, 14.1.

Considerable anxiety is at times felt in the Uni
contagious diseases introduced by members of the
In 1908, for example, there were 101 cases of scarlet
distributed through short course students. In the sa
were forty-four cases of diphtheria, with nine de
year before eight deaths from the same disease, wi
cases. Malaria has been nearly stamped out, larg
been expended for treating the swamps and eliminati
toes. The city is now agitating the question of a mun
for the care of contagious diseases, in co-operation
versity and it is probable that before long such a bu
provided. No medical inspection of the public scho
on account of the unwillingness of the board of ed
pend moneys raised for educational purposes for me
is to be hoped that this board will appreciate the re
physical condition and mental development and w
that the elimination of physical defects tends towar
provement quite as much as instruction itself.

Milk

The milk supply of the city is under the direct supervision of the board of health and is most carefully and thoroughly cared for. The principle of control lies in a rigid inspection of the farms from which the milk is produced, and dealers obtaining licenses from the Board of Health are obliged to certify to the name and residence of every person or farm from which milk is obtained. Definite and strict rules are laid down as to the condition which must obtain on these farms, and the board reserves the right to revoke and cancel the licenses should these conditions not be maintained. It is of interest to note that the rules had the benefit of the advice of Honorable R. A. Pearson, Commissioner of Agriculture, formerly member of the board of health of the city of Ithaca, and includes such specific recommendations as the number of cubic feet of space for each cow in the stable, and the temperature to which the milk shall be cooled after milking and maintained until delivery to the consumer. There are thirty-one dealers in the city and eighty-nine farms from which the milk is collected. The farms are inspected under the direction of the professor of dairy husbandry of the University, two or three times each year, and the scores are printed in the local papers at least once a year. Farms on which contagious diseases are found are promptly excluded from furnishing milk, and conditions generally are satisfactory so far as milk supply is concerned.

Garbage

The garbage of the city is collected under the direction of the garbage committee of the city council, the city teams provided for the fire department being used. Some care and judgment is needed in dividing the city into districts so that no team shall be
more than a limited distance from the fire apparatus, and so
the haul to the dump shall not be excessive. With these
tions this method of collecting garbage has been very
and economical. The household swill during the
quired to be separated from the ashes, and the la
the streets and in filling low land as near the p
as possible. In the summer two kinds of garb

gether, with a view to eliminating odors from the putrescent matter. Papers collected are required to be baled or bagged so that they shall not blow around the streets or on the dump, and are burned with other combustible matter openly on the dump. The lowland on the flats is being gradually filled, with decided benefit, so far as mosquito breeding places are concerned, and with a minimum of nuisance since the dumps are cared for by competent men who keep the organic matter covered with ashes or other rubbish. At present there are three dumps, one in the northern part of the city near the sewage pumping station, one in the southern part of the city near the water works station, and one on East Hill near the University. The street sweepings are sometimes taken to these dumps, but more often are used for filling behind the curbs as these are laid and for filling-in on lawns where regrading is done. Some swill is collected by farmers living outside the city, the large boarding-houses and hotels furnishing practically all swill used in this way.

Sewerage

The sewer system of Ithaca furnishes the unusual and gratifying spectacle of a complete sewer system covering the entire city, built according to a well-devised plan. The system was designed by Rudolph Hering and J. H. Fuertes in 1892, and the construction was commenced in accordance with their plans in 1894. The system involved three mains leading to different sections of the city and receiving the laterals from their respective districts. These mains lead to a receiving well in the northern part of the city from which by centrifugal pumps, the sewage was forced through a pipe line 10,700 feet long into the lake, a distance of about one mile from shore. A year ago, because of the increasing volume of sewage and the lack of capacity of both pumps and outfall pipe to care for this volume, a sedimentation tank 98 x 127 x 10 feet deep was built adjoining the pump house from which the clarified effluent is led into the inlet as shown on Plate 1. This plate shows the distribution of the sewers throughout the city and the completeness with which the needs of the city are met. The district lying south of Six Mile creek is too low to dis-

charge directly and has its own secondary receiving well and pump which forces its sewage through a force pipe into the main system at the corner of Plain and Hill streets. This pump is a submerged centrifugal pump operated by a motor which starts and stops automatically through a float in the sewage. Another district in the southwestern part of the city is too low to discharge directly into the main receiving well and is lifted automatically twelve feet by a pump at the corner of Buffalo and Meadow streets. This pump is an air pump furnished by the Shone Company, and operates without valves or mechanism other than simple flat valves. The compressed air needed is generated at the main pumping station a mile away and the machinery is under the care of the engineers operating that plant. The sedimentation tank was started in operation at the beginning of the year 1908, and except that the odors were conspicuous at the beginning, it has given entire satisfaction. A scum of about three feet in depth has formed since the roof was put on and the effluent is generally clear.

Purification Effected by Septic Tank.

	Oxygen consumed test		Per cent.
1908	Raw sewage	Septic sewage	purification
March	42.4	24.8	41.5
April	43.3	24.6	43.2
May	46.2	26.2	43.3
Average, 1905	39.0	29.8	23.6
Average, 1906	46.7	28.3	39.4

The creek commission is engaged (1909) in digging a channel which shall straighten the course of the present inlet as indicated on the map. This will probably require the present outfall pipe to be extended about 500 feet beyond its present extremity. The sedimentation tank is so designed that in the future, should additional purification be required, the sewage will flow by gravity onto suitably prepared contact beds, located on the flat north of the present tank. It seems, however, at present that t
is of no need of further purification, since there has bee
tion of local nuisance and since the water of the
for drinking purposes, except at the north end,
The following table gives the total amoun

city since 1895, and shows a total mileage of about 35.00 miles, including 4,000 feet of compressed air line:

		Feet	
1895.	Lake outfall	10,500.0	
	Compressed air line	4,045.0	
	Main sewers	17,740.0	
1896.	Street laterals	29,425.0	
"	" "	61,049.9	
1897.	" "	856.5	
1898	" "	763.8	
1899.	" "	3,152.8	
1900.	" "	3,588.1	
1901.	" "	968.5	
1902.	" "	1,781.5	
1903.	" "	2,700.0	
1904.	" "	1,339.8	
1905.	" "	3,520.3	
1906.	" "	7,391.5	
1907.	" "	7,417.2	
1908.	" "	4,073.2	
			167,777.1
	Titus Flats discharge line		2,594.5
			184,916.6 or 35 mi.

The following table shows the total number of fixtures connected with the sewers to date and shows, judging by the number of closets and sinks, estimating five persons to a house, how generally the houses of the city are connected with the sewers. It is interesting to contrast the number of baths in Ithaca with a population of 14,615, with the number of baths in Geneva, population 12,249, the number in the former being about two times that of the latter:

1908		Totals to date
Closets	155	3,607
Baths	86	2,000
Bowls	98	2,444
Sinks	144	3,261
Laundry trays	24	416
Urinals	2	138
Other fixtures	8	76

Pavements

The pavements of Ithaca are commendable both as to their condition and from the point of view of their total mileage. Plate 2 shows the location and kind of pavement, and shows the preponderance of the use of brick, which has been found eminently satisfactory. Some of the brick pavement has been down fifteen years and except for one block where the integrity of the pavement has been destroyed by repeated trenching, it is all in good condition. The hill streets, with grades of from 10 to 16 per cent., are of Belgium block with cement-filled joints. The macadam roads have been laid chiefly on those streets connecting with the thoroughfares leading to adjacent towns and in all directions have been continued as State roads to those places. The streets are cleaned by hand sweepers in the business district and by street sweepers (horse), which cover the entire pavement of the city at least once a week. The macadam streets are scraped and swept twice a year, in spring and fall, and one street, Aurora street, has been treated with Tarvia experimentally. The dirt streets are well crowned and a large proportion of them are marked with concrete curves and gutters, which add much to the appearance of the streets.

Ice

There are two ice companies in Ithaca, one known as the Ithaca Ice Company and the other as the Hygeia Ice Company. The ice delivered by the former company is purchased at Cayuga and is cut from the lake at that point. This is of good quality, free from contamination, and well suited for domestic needs. The Hygeia Ice Company buys a portion of its ice from the Hygeia Ice Company of Elmira, manufactures a portion of its ice in its own ice plant in Ithaca, and cuts a portion on an artificial pond fed by an artesian well within the limits of the city, and another part from the spring lake near the village of Dryden. This supply also is good. A number of butchers in the city have private icehouses in which ice is stored for cooling only. This ice is cut in the inlet and on the shores of the lake and is not suited for domestic uses, but no public sale of this ice is made, and the local board of health has prohibited any distribution of such ice.

Water Supply

The water-works of Ithaca have undergone considerable vicissitudes since their original installation. The original construction was undertaken in 1872 by a private company and consisted of a small dam on Buttermilk creek with a 10-inch pipe line to the city. This proving insufficient, a few years later a second dam on the same stream was built, supplying a greater storage during dry weather. A small distributing reservoir on South hill served as an equalizing reservoir and also reduced the pressure, which was excessive for the lower part of the city. About 1885, in order to still further increase the quantity, a small dam was built in Six Mile creek and steam pumps installed by which water could be lifted to the South hill reservoir. Still later, water-wheels were placed, so that this pumping is done by water. The water company exercised considerable care over the quality of the water supply and spent many thousands of dollars on the watersheds in moving barns and privies, in building cesspools and in laying drainpipes around stables and barnyards.

The epidemic of 1903 was undoubtedly due to a pollution of the water in Six Mile creek, although the exact source of the pollution of the water was never determined. Dr. George A. Soper, who was detailed by the State Department of Health to take charge of the epidemic on behalf of the State Department, found numerous sources of pollution on the stream, over 100 nuisances being reported by his inspector. He found six cases of typhoid fever which had occurred on the watershed during the twelve months preceding the outbreak at Ithaca. There was also a possibility that the outbreak was caused by the excrement of a gang of Italian laborers who were at work on the construction of a dam on Six Mile creek, a short distance above the water company's intake. From whatever source, the epidemic was most severe and deserves to be regarded as one of the greatest outbreaks of this preventable disease that ever occurred in New York State. As already mentioned, there were some 1,300 cases of

typhoid, all in about three months. Under the guidance of Dr. Soper, prompt remedial measures were taken in hand, and within a month after his arrival the epidemic was under control and soon died out. Except under military law, such strict supervision as obtained in Ithaca at that time is rarely seen. Nurses were imported from cities as far away as New York and Philadelphia, hospitals for temporary use were opened both in the town and in the University, and the strictest measures were practiced in the matter of disinfection from the patients. The city distributed milk of lime and bichloride of mercury by the barrelful, 23,000 gallons of the former and 2,000 gallons of the latter being used. The privies were all cleaned and disinfected, about 12,500 barrelfuls being removed. The well waters in the city were practically all examined and the water analyzed, 946 wells being examined. Thirty per cent. of these were condemned and closed. A careful inspection was made of all milk supplies and the possibility of infection from this source prevented. Through the co-operation of the University with the water company, mechanical filters were constructed in order to prevent a recurrence of the epidemic, which has since furnished to the city a satisfactory supply.

The year following this epidemic, and doubtless influenced by the feeling that the water company had been responsible for it, the citizens voted, by a large majority, to secure control of the water-works for a municipal supply. After hearings lasting a year, the special board of commissioners appointed for the purpose, fixed the valuation of the plant, which was paid by the city, and since 1906 the city has owned and controlled the water-works. As a corollary to the deep feeling of those in Ithaca at the time of the epidemic, and of their blind prejudice against the Six Mile creek water, even when filtered, it was found practically impossible by the newly organized municipal water board to continue to operate the water-works, taking water from that creek, and a large sum of money was spent in developing a well supply in the valley and in making test borings for an additional supply from the hills. "Water from the bowels of the earth," was the watchword of the opposition, and only within the last two or three years, particularly since the well supply has been found entirely inadequate, has the use of the filtered creek water been general. Even to-day, a supply of spring water is brought in eight miles daily by a farmer, who for seventeen years has been furnishing this water to those in the city who have been afraid of the surface water supplies. About 500 houses are so supplied, in addition to a large number which use distilled water and other bottled waters.

The filter plant itself, as operated under the direction of Professor Chamot of Cornell University, has given admirable satisfaction, although the character of the water is one which is very difficult of treatment. The runoff is exceptionally rapid, so that even moderate rains increase the turbidity largely, which is usually accompanied by a corresponding rise in the bacterial count and in the number of fecal and putrefactive organisms. The turbidity frequently rises from less than 100 to over 3,000 in less than five hours, and clearing almost as rapidly as it rises. The bacteria in the raw water show almost as great variation, several hundred thousand per c.c. being not uncommon. The efficiency of the filters averages 99 per cent. or more, and the number per c.c. in filtered water rarely averages more than 100 for the month. The effect of the pure water supply on the health of the city, aside from the reduction of the typhoid fever death rate already referred to, is shown by the fact that the average number of deaths of infants under five years, before the installation of the filters, and excluding the typhoid year, was thirty-two, while in the three years following their construction, the average was twenty-seven, a reduction of 16 per cent., while the reduction of diseases which might be directly attributable to the water supply have been reduced 60 per cent.

The present interest in the water-works now centers on a reduction of the operating expenses, inasmuch as the present system of pumping from Six Mile creek to the filter plant, and from the filter plant to the reservoirs involves large operating expenditures. It is now proposed to build another dam on Six Mile creek far enough upstream so that water may flow to the filter beds by gravity. This will also undoubtedly improve the quality of the effluent, since it will allow the admission of the water to the beds to be kept better under control. The analysis of the water as made to the local board of health during the year 1908 are given in the following table:

Month.	Average % Bacteria removed by all filters		
	1903	1904	1905
January	....	98.1	98.8
February	....	97.9	99.0
March	....	99.1	98.9
April	....	99.0	99.4
May	....	98.3	99.3
June	....	98.7	99.1
July	....	96.7	98.3
August	....	97.8	96.5
September	....	97.9	99.1
October	99.8	98.3	99.4
November	99.5	97.8	98.8
December	98.9	97.8	98.6

Creeks

Through the conditions already referred to under topography, Ithaca has always suffered more or less regularly by inundations from the creeks. Six Mile creek, Cascadilla creek, Fall creek and the Inlet have all at times, particularly in the spring when the ice was going out, overflowed their banks, flooded the streets and yards and filled the cellars in the western part of the town. This has involved not only a large financial loss to those locally affected and to the city as a whole, but has also without question influenced the health of the community. In 1894, when Mr. Hering was planning the sewerage of Ithaca, he also designed a scheme for drainage which involved dikes along both banks of both streams and along the lake front, and pumping stations to throw out the rainfall which fell on the inclosed area whenever the water in the lake and creeks was higher than the land. This scheme, since 1907, has been adopted with some modifications, at an expenditure of about $140,000, and the Six Mile creek and Fall creek improvements are now completed. The Inlet has been widened under an appropriation by the State, and ample provision is now made for leading the storm waters from the hillside rapidly. Some improvements yet have to be made on

Cascadilla creek, and further dredging in the lower parts of the Inlet, where it enters the lake, has to be done before the entire plans are carried out, but the work deserves to be mentioned as a commendable evidence of the enterprise of the city even though it has been so long delayed.

Summary

(1) Ithaca is a residential city, influenced largely by the residence for nine months of the year of about 4,000 students of Cornell University.

(2) The portion of residents of foreign parentage is very small and the character of the population generally is higher than the average in intelligence and in public spirit.

(3) The general death rate in Ithaca is 15.9, including the epidemic year, 1903, and 15.4 if this year is excluded. This is 2.7 lower than the average rate for cities in New York State, and lower than the general death rate in any country of the world except Sweden. Some doubt has been thrown on the accuracy of the vital statistics in Ithaca in years past, but it is probable that at present the local statistics are as reliable as in any city of the State.

(4) The typhoid fever death rate for the past five years is 13.6 per 100,000 population, and for the past two years is 6.5. In 1903 a serious typhoid epidemic occurred, with 110 deaths and 1,350 cases, out of a population of 14,615. Before 1903 the rate was variable, ranging from 45.7 to 6.5.

(5) The death rate of children under five is very low, but, in view of the lack of data on the number of children in the city, this rate has no special significance.

(6) The milk supply is under the careful supervision of the local board of health, who issue licenses and, through a duly qualified inspector, score all farms producing milk two or three times each year. Milk from farms on which contagious diseases occur is promptly shut out from delivery in the city and licenses have been revoked for failure to observe rules of the board of health.

(7) The method of garbage collection and disposal is satisfactory and thorough. The city collects garbage once a week in

winter and twice a week in summer and uses garbage and refuse for filling in marshy ground within the city limits.

(8) The sewerage system is complete, covering all parts of the city and the disposal is satisfactory from the standpoint of local nuisance. It is possible that in the future a further purification may be required.

(9) The pavements of the city are in good condition and constitute 25.43 per cent. of the total mileage of streets. They are properly cleaned and the street sweepings satisfactorily disposed of.

(10) The ice supply is either artificial or cut from properly protected waters and may be considered satisfactory.

(11) The water supply, although of a suspicious character in the past, is now properly cared for and, since the construction of the filter plant in 1904, of a good character.

(12) The care of the creeks throughout the city which have heretofore doubtless contributed something to the ill-health of the community through the periodical inundations, are now being fully assumed by the city authorities. The creeks are being confined to their channels and led directly into the lake through channels properly proportioned to the maximum flow. As soon as an adequate outlet for the lake itself is provided all danger from this source will be past and whatever diseases may have been due to flooded cellars and inundated yards will then be a thing of the past.

Conclusions

The writer is brought to the conclusion, after his personal visit to Ithaca, after a tabulation of the mortality statistics of the city and a careful study of the same, that Ithaca is a city more than normally healthy, and that the public spirit of the place may be reasonably depended upon to make such a fortunate condition permanent and lasting. The only caution to be suggested is that the eternal vigilance, which alone is the price of safety, should not be allowed to diminish, but that unceasing care should be exercised through the board of health and their executive officers to continue to guard the purity of the water and milk, as seems to be now so carefully done.

H. N. OGDEN,
Special Assistant Engineer

MOUNT VERNON

ALBANY, N. Y., *June* 17, 1909.

MR. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit herewith a report on an investigation of the sanitary condition of the city of Mount Vernon, Westchester county.

Historical

The city of Mt. Vernon in age presents the incongruous spectacle of being at once young and old. Between 1900 and 1905 the city increased in population from 19,830 to 25,006, or at the rate of almost exactly 1,000 persons per year. Such an influx of population has required constant building to house the new citizens, constant extension of roads, sewers and water pipes to meet their municipal demands, and the building up of large mercantile establishments to furnish the provisions needed to feed the growing numbers. On the other hand, the original village of East Chester is one of the oldest in the State. In 1640 the present site of Mt. Vernon was included in a grant whereby the Indians conveyed to the Dutch all the territory situated between the town of Greenbush on the Sound and the North river, and in 1666 we find this grant confirmed by an imposing array of Indian sachems, the occasion being the settlement of ten families on the Hutchinson river at the extreme southeast corner of the present city. One of the oldest landmarks of the city is the old St. Paul's church and graveyard near the place of the early settlement, the present building having been erected in 1765 or nearly 150 years ago. The records, however, show the parish to have been in existence for over 200 years, an act of 1699 providing a special public tax for constructing church buildings for that church established by law. The tombstones in the graveyard bear dates as early as 1704. For many years Mt. Vernon was the municipal village of this early settlement, and in 1853 it was incorporated, containing at that time four churches and 1,161 inhabitants. Since incorporation, the village has grown steadily, slowly at first, but with increasing impetus. The village became a city about 1895, and is now a residental community of more than

5,000 dwellings. The proximity to New York city (the Third Avenue street cars affording continuous transportation) has made it an ideal location for suburban homes, and mile after mile of shaded street is lined on both sides with modest and modern houses.

Topographical

The city lies between two rivers, the Bronx on the west and the Hutchinson on the east, the southern boundary being the north line of New York city, and the length of the city north and south being about three miles, giving an area of about five square miles. The southeast corner is at the point where the Hutchinson river empties into the Sound, and in early days this possibility of water communication with New York and Long Island made one of the cogent reasons for the settlement and growth at this particular site. The central part of the city is 150 feet above the Sound, this altitude being one of the attractions of the city. The drainage is chiefly to the east, and at present one house sewage from the western part of the city is pumped over the ridge, although the street water continues on into the Bronx river. The New York, New Haven & Hartford railroad passes through the city in a long curve from south to east, and by its deep cutting divides the city into two parts, connected by a number of bridges.

Sociology

The city is pre-eminently one of homes — and largely for those whose business is in New York city. According to the census of 1900, the population of 21,228 was divided between 15,963 native-born and 5,265 foreign-born, or about 25 per cent. foreign-born, a small percentage compared with other suburban villages of the vicinity. And this proportion is diminishing since the younger generation is in far greater proportion native-born. For example, between the ages of five and twenty years there were in 1900, 5,460 persons native-born and only 662 foreign-born, or 12 per cent., showing that the foreign population is of some years standing and is not being added to by immigration.

The housing of the city population is not congested. Twenty-one thousand, two hundred and twenty-eight persons were accommodated in 3,555 dwellings or 6.0 persons per dwelling, according to the 1900 census. Compared with Schenectady, where there were 7.0

persons per dwelling, or with Cohoes, where there were 8.1 persons per dwelling, this is not high, although other cities of the same size farther from New York city have only from 4.0 to 5.0 persons per dwelling. It must be remembered that on account of the proximity to New York city, there will be an increasing demand for houses and a tendency, already marked, for property owners to build apartment houses, in order that the high values of land may return suitable revenue. There were in 1900 4,404 families in the 3,555 dwellings, or 1.2 families per dwelling, instead of nearly 2 families per dwelling as at Cohoes, showing that there is but little tenant-house congestion. There are two parts of the city where the foreign element is conspicuously present, one, on the south side of Fourth street, where the buildings are well built city blocks, thickly populated, but where the conditions of living have become apparently Americanized; and the other, on the north side in the vicinity of Fourth avenue, where the houses are small, out of repair, and having the general appearance of a foreign settlement. Except for these two places the city seems to have no tenement house districts, nor any conspicuously insanitary localities.

Industries

The industries of Mt. Vernon are only those locally essential to the comfort of the community. Fifty-four establishments are reported by the census, employing, however, but 670 persons, and they include such manufacturing as bakestuffs, other food preparations, lumber mills, soda-water works, printing shops, tobacco factories, etc. There are two small silver smithing and silverware factories which are practically the only factories whose products are exported from the city.

Counting all the products and grading the city industrially by the value of these products, Mt. Vernon ranked in 1900 forty-second among the cities of the State, although in size its rank was twentieth, again showing the absence of manufacturing. Newburgh and Kingston, about the same size as Mt. Vernon, reported in 1900 manufactured products to the value of over $1,000,000, while Mt. Vernon only reported $288,000 value. This absence of manufacturing reacts both on the character of the population, eliminating largely the uneducated and dependent class, and on the attitude of the population toward the city, making the well-being of the city as a whole a matter of concern to every individual instead of a matter of indifference so long as some particular factory continues to run.

Mortality Statistics

As one might expect from the character of the city, already referred to, Mt. Vernon has all the marks of a healthy city, and a study of mortality statistics for the past eight years does not belie the expectation. The general death rate for the past eight years is shown in the following table, the populations being interpolated between the United States census of 1900 and the State census of 1905, and the deaths taken from the vital statistics of the State Department of Health:

TABLE SHOWING GENERAL DEATH RATES IN MOUNT VERNON PER 1,000 POPULATION FOR 1901-1908 INCLUSIVE

Year.	Population.	Deaths	Rate per M
1901	21,984	326	14.8
1902	22,739	310	13.6
1903	23,405	282	12.0
1904	24,250	352	14.5
1905	25,006	331	13.2
1906	25,761	403	15.6
1907	26,517	399	15.0
1908	27,272	388	14.2

Average = 14.1

That this is an unusually low rate may be seen by comparison with the death rates of cities in New York and other states, as shown in the following table from reports of the United States census office:

TABLE SHOWING GENERAL DEATH RATES PER 1,000 POPULATION FOR CITIES IN NEW YORK AND OTHER STATES FOR THE FIVE YEAR PERIOD 1903-1907

	1903	1904	1905.	1906	1907	Average Rate
New York	17.4	19.2	17.8	18.0	18.3	18.1
Connecticut	16.8	16.1	16.9	17.3	17.6	16.4
Indiana	14.6	15.7	14.0	14.1	14.0	14.8
Maine	18.4	19.5	17.9	18.1	18.9	18.5
Massachusetts	16.9	16.4	16.9	16.8	17.7	16.9
Michigan	14.9	14.3	14.6	15.9	15.7	14.6
New Hampshire	16.9	16.1	18.1	18.1	17.6	17.0
New Jersey	17.4	19.0	17.5	18.0	18.2	17.9
Rhode Island	18.9	17.2	17.1	17.0	18.4	17.9
Vermont	17.9	17.1	18.3	18.0	16.5	17.1
Mt. Vernon	12.0	14.5	13.2	15.6	15.0	14.1

Too much stress should not be placed upon the general death rates since they are of the nature of averages and are greatly affected by the peculiarities of age and sex, the constitution of the population according to color, nativity and other factors; nevertheless, such rates are the first guides to judgment to which one may appeal in studying the sanitary condition of a locality, and it is entirely proper that they should be considered as valuable, if not infallible aids, especially when, as already pointed out, the other general conditions affecting such rates are normal. The fact, however, that in Mt. Vernon there is a noticeable lack of conditions tending to produce a high death rate and that the general death rate corroborates such advantageous conditions should not result in entire satisfaction at a death rate, low in comparison with other cities where such fortunate conditions do not prevail, unless, indeed, the death rate is reduced in direct ratio with the elimination of the disadvantageous conditions. A rate of 15.0, for example, in Poughkeepsie, would be low, while in Mt. Vernon it is high. A comparison of death rates evidently does not indicate entirely or accurately the health conditions of the city.

The death rates from typhoid fever, a much used index of the sanitary condition of a city show, however, the same positive evidence of healthy environment and living. The following table gives the rates for the past eight years:

TABLE SHOWING THE TYPHOID FEVER DEATH RATE PER 100,000 POPULATION IN MT. VERNON FROM 1901-1908, INCLUSIVE.

Year	Population	Deaths	Rate per 100,000
1901	21,984	3	13.7
1902	22,739	2	8.8
1903	23,495	2	8.0
1904	24,250	5	20.6
1905	25,006	5	20.0
1906	25,761	6	23.3
1907	26,517	10	37.8
1908	27,272	2	7.4

Average = 17.4.

A comparison of the rate in the United States with those of other countries shows that the mortality in the United States from typhoid fever is much higher than any other country except Spain and Italy, and should be subject to marked decrease in future years. The following table shows the comparison:

TABLE SHOWING THE TYPHOID FEVER DEATH RATE PER 100,000 POPULATION IN THE UNITED STATES AND OTHER COUNTRIES

COUNTRY	1902	1903	1904	1905	1906	Average 1901–5
U. S. Registration, area	34.4	34.3	31.9	28.1	32.1	32.2
Australasia	20.5	25.5	15.5	13.7	15.7	19.0
Austria	18.1	19.7	19.3	......	......	19.9
Belgium	17.8	15.6	14.9	13.7	......	16.8
Germany	7.0	7.3	7.0	6.3	......	7.6
Italy	34.6	35.5	36.9	32.7	28.1	35.2
Japan	11.4	9.8	10.8	13.2	......	11.6
Spain	45.8	43.4	44.4	37.7	42.2	44.5
Sweden	10.4	5.3	5.1	......	......	8.3
Switzerland	6.0	5.0	7.7	5.0	......	6.2
England and Wales	12.6	10.0	9.3	8.9	9.2	11.2

Except for Spain, Italy and the United States the rates are all below 20, and for Switzerland, Sweden and Germany below 10 per 100,000. Evidently, therefore, a comparison of typhoid rates between different cities of this country or between any city and the average rate of cities in this country is misleading, since they are all unduly high. For example, in the year 1907 seven cities in the United States had rates of more than 50 per 100,000 population, rates which in England, for example, would cause general consternation and would be regarded as a serious epidemic. These seven cities were, in order of mortality: Pittsburg, Pa. (130.8); Allegheny, Pa. (96.9); Scranton, Pa. (75.8); Louisville, Ky. (67.9); Denver, Col. (67.1); Philadelphia, Pa. (60.7); New Orleans, La. (55.5).

Smaller cities show the same high rates. For example, in this State the census bureau reports the following rates for cities of about 25,000 population for the five-year period 1903–1907:

Amsterdam	26.2
Auburn	17.3
Cohoes	77.0
Elmira	49.9
Jamestown	27.8
Kingston	22.4
Newburgh	40.3
Niagara Falls	144.4

Oswego	64.6
Poughkeepsie	79.3
Watertown	79.6

Compared with any of these cities, except Auburn, Mt. Vernon has a most satisfactory death rate, but compared with the countries of Europe it is not so gratifying. In fact, as long as the typhoid rate is above 10 per 100,000 constant vigilance and watchful care should be exercised at every point in order to improve hygienic conditions and reduce the typhoid death rate. The question naturally arises: "Why is the typhoid death rate so much lower in England and Germany than in the United States?" Whipple gives as the reason chiefly that in the foreign countries they are far more particular about the drinking water. Seldom do they furnish for drinking purposes the raw water of some polluted stream. If surface water must be used it is filtered, sometimes twice, and then perhaps sterilized. It may be that less water is used as a beverage, that milk is generally boiled before using, that oysters are eaten in less quantity; but the chief reason is the insistence on pure water, a demand which is reflected in the German law requiring all surface waters to be filtered.

The fact that in Mt. Vernon in the three years from 1905 to 1907 the typhoid death rate rose from 20.0 to nearly 40.0 (37.8) was an alarming symptom, and it is doubtless of considerable relief to the local board of health to find that the figures at the end of 1908 show a rate as low as 7.4. This last is entirely satisfactory, although some remnants of uneasiness must linger until the high rate of 1907 is lost to memory.

Another way of checking the hygienic conditions of a city is by the number of deaths of children under five, since children are particularly susceptible to impure food and milk. In the registration area in 1907 the number of deaths under five was 183,774 and the population was 41,758,037, a rate per 10,000 population of 44.1. If registration cities only be taken the normal rate is 49.6, while if the rural part of the registration states is considered the normal rate is 34.5, showing how seriously city life affects the child death rate. In Mt. Vernon the death rate of children under five years has been as follows for the past eight years:

TABLE SHOWING DEATH RATES PER 10,000 POPULATION OF CHILDREN UNDER FIVE YEARS.

Year	Population	Deaths	Rate per 10,000
1901	21,984	17.6	80.0
1902	22,739	14.1	62.0
1903	23,095	7.1	30.2
1904	24,250	12.4	51.1
1905	25,006	9.4	37.6
1906	25,761	15.5	60.2
1907	26,517	12.6	47.5
1908	27,272	12.9	47.3

Average = 52.00.

This rate is somewhat above the normal for cities (49.6) and especially in view of the small foreign population and the general character of the population already noted somewhat surprising. So high a death rate suggests insanitary conditions of housing and a large proportion of children to total population, both accompanying a foreign element. But while the number of children is not given in the census bulletin, the character of the city is such that the number of children is probably less than the normal. It must be concluded, therefore, that the water supply or the milk supply, or both, contain an excess of organic matter to which the excessive death rate is to be attributed.

Again, the normal ratio of deaths under five to total deaths in cities where the proportion of children to total population is normal is about 30 per cent. In the registration cities of the United States in 1907 there were 464,673 deaths in all ages and 131,159 deaths under five, or the ratio was 28.2 per cent. In New York State for the same year there were 146,882 deaths at all ages and 39,773 deaths under five, or the ratio was 27.1. In Massachusetts in 1906 there were of all ages 50,431 deaths and 14,902 under five, or 33.8 per cent., while in the registration area of the United States the total deaths were 687,034 and those under five 183,774, or 27.0 per cent.

In Mt. Vernon these ratios have been as follows:

Year.	No. deaths	Under five	Ratio.
1901	392	176	44.9
1902	335	141	42.1
1903	272	71	25.4
1904	348	124	35.6
1905	325	94	28.9
1906	403	156	38.4
1907	404	126	31.7
1908	399	129	32.3

Average = 34.9.

This is apparently again higher than the normal, although the ratio is affected by the number of children living among whom the death rate is high. The typhoid death rate being normal, on the average, and in the year 1907, when this rate was highest, the death rate among children being by both tests below the average, it would appear that the cause of high typhoid is not the cause of high death rates among children. In 1901 also, when the death rates among children was the highest, 80.0 per 10,000 population and 44.9 per cent. of all the deaths, the typhoid rate was only 13.7 or 3.7 below the average. This lack of agreement indicates that if an impure water causes excessive typhoid, then impure milk is probably responsible for excessive child deaths, or vice versa. It now remains to examine the general sanitary condition of the city to ascertain, if possible, the cause, or causes, of the inequality of the typhoid rate and of the high death rate among children.

Milk Supply

The board of health of the city have entire supervision of the milk supply of the city and apparently maintain a close supervision over the quality of the same. Section 87 of the Sanitary Code forbids any person to sell milk in the city without a permit from the board, and permits are granted subject to the inspection and approval of the dairies, bottling works, etc. The code prohibits the sale of skimmed milk unless the vehicle from which such milk is sold is plainly marked " Skimmed milk." Improper food for the cattle is prohibited and a standard of fats in the milk established. Dealers are required to file a complete list of all persons or dairies from which milk is obtained, with the number of cows, and a statement of the number of gallons of milk distributed.

The following list was taken from the health officer of the dealers distributing milk in Mt. Vernon at the time of the writer's inspection:

Borden's Condensed Milk Company, Chatham dairies, Chatham, N. Y.; 2,500 gallons daily; 31 wagons; 1 store.

Willowbrook Dairy, dairies in Connecticut; 750 gallons daily; 12 wagons; 2 stores.

E. F. Brush, 315 South Fifth avenue, Mt. Vernon; 200 gallons daily; 1 wagon.

Joseph Hopfer, 326 North Terrace avenue; milk from Dederer farm, Greenville; Raymond farm, Yonkers; 200 gallons daily.

Mrs. Louisa Kochler, 32 South Sixth avenue; milk from J. A. Lee, Brookfield, Conn.; 150 gallons daily.

Mr. D. E. Weserman, Union Corners; 60 gallons daily.

Barnet Shapiro; milk from Kosintz farm, Tuckahoe; 20 gallons daily.

The following notes of the inspection made by the board of health inspector, bearing date of May 22, 1908, show the general character of the inspection and of the care practiced in handling the milk:

Inspection of Milk Dairies — May 22, 1908

Kosintz dairy distributed by Barnet Shapiro. No facilities for sterilizing, scalding, or even washing cans. Milk strained through cheese cloth, cooled in spring house. Barns partly under ground. Well ventilated. Absolute lack of modern apparatus and methods.

E. R. Raymond. No facilities for sterilizing or scalding the cans. Barn well ventilated.

George Dederer. Methods like those above. Milk strained through cheese cloth. No aeration, then cooled in spring house. Barn best in neighborhood except that of Dr. Brinsbi. Clean, white-washed, roomy and well ventilated.

Mrs. Kohler. Bottles and cans not sterilized or washed at the farm, but is said to be done at the creamery at Brookfield.

Wiseman dairy. April 26th. Barn empty, clean and well ventilated. Milk room clean. Bottles sterilized and rinsed in hot water. Cans scalded. See personal visit.

Farrington Farm of Joseph Hopfer. Bottling place in old barn. Good sterilizer and automatic bottler. Place clean. Wooden floor rotten, and basement full of accumulation.

Borden's plant. Pasteurization not practiced. Cream bottled here. Good sterilizing plant.

Willow brook. Apparatus for bottling, pasteurization, refrigerating, and sterilizing is all modern. Manure too near building. Milk heated to 130°, otherwise (higher) cream separates, causing blue appearance to milk, unsatisfactory to customers. Best and safest milk in Mt. Vernon. Milk from Sheffield and Merwinsville, Conn.— 100 dairies.

It may be inferred from the above notes of the inspector, and the personal observation of the writer agrees therewith, that there may be some reason for suspecting the continual cleanliness of the milk supply of the city. It was not apparent that any tests of the milk are made and reliance is placed on the reputation of the dealers and on the occasional visits of the inspector. The proximity of the city to New York invites the same large firms that supply milk to the latter city to distribute also in Mt. Vernon, and the wide area from which the milk comes, the amount of milk, and the number of dairies involved would make a complete system of control practically impossible without prohibitive expense. The practical check on the quality of the milk, and the one which seems feasible for the city to undertake is a bacteriological examination of samples of milk taken from the different wagons coming into the city. The bacterial count would then be the index of official action. It is now recognized that in clean milk, properly cooled, a count of 50,000 bacteria per c. c. is possible without requiring undue expense or hardship on the farmer, and that if the count gets above 100,000 the milk may probably be considered dirty and possibly polluted. The writer suggests that for the improvement of the milk supply a laboratory be instituted and a standard set for milk which may be distributed. Publicity is the great ally of those interested in public health measures, and the publication in the papers of the names of milk dealers, the bacterial content of whose milk was in excess, would, especially in so enlightened a community as Mt. Vernon, without question soon result in an improvement in the quality of the milk, or else so affect the sale of the milk as to eliminate the distribution of the polluted supply.

Garbage

The garbage of Mt. Vernon is taken care of by contract extending from January 1, 1907 to December 30, 1910, the contractor, being bound to collect all garbage offered twice a week in summer and once a week in winter. The contract provides that the collection shall be made in wagons with tight boxes, closely covered and that all the operations of collection as well as the condition of the dumping ground shall meet with the approval of and be under the supervision of the board of health. The garbage is dumped on the grounds of the Mt. Vernon Suburban Land Company at East Chester, just outside the city at its southeastern corner, adjacent to the Hutchinson river, and men are stationed on the grounds to keep the organic matter covered and generally to keep the dump in good condition.

The street sweepings, collected and cared for by the city are used for filling low lots. The west side dump is by the side of the sewer pump station at the lower end of Mt. Vernon street. Another dump is back of North Second and Third streets, north of the railroad siding by the electric light station. A large part of this is hauled away by farmers and others for fertilizer, so that these dumps are only temporary in nature, and store the sweepings until carted off.

There are seven carts drawn by one horse, and forty-five hand sweepers, on the average, constantly employed taking care of the forty-two miles of improved streets, the forty miles of unimproved streets naturally receiving less attention. The business sections are swept daily, and the residential portions swept once a week. The board of health collects on notification dead cats and dogs which are buried on city lots, and the dead horses are hauled to the crematory at Yonkers, for which the crematory is paid a definite sum. The board of health has an inspector constantly employed, whose duties include, among other things, the distribution of disinfectant in back yards, in vaults and elsewhere when such distribution seems needed.

The city has fifteen sprinklers, which, working eight hours per day, cover the city, each being assigned to about five miles of streets. This enables each sprinkler to keep its territory well watered and the general effect and impression of the condition of the city streets is one of careful supervision and adequate care.

Sewerage

The sewers of Mt. Vernon are of comparatively recent origin, the construction having begun in 1888. Since then lateral sewers have been added from year to year, until now about two-thirds of the city is sewered. The rapid growth of the city has necessarily caused a constant demand for new sewers which demand is met as rapidly as possible. The sewers are on the separate system and are estimated to discharge 2,000,000 gallons daily. The outlets are direct into the Hutchinson river, one at the foot of East Fifth street, one in the vicinity of the end of East Sixth street, and one at the end of South Fulton avenue. The sewage from the western side of the city, draining naturally to the Bronx river, is received in a well at the west end on Mt. Vernon street and pumped up into the main leading eastward. From the beginning, the method of disposal of the sewage has been a matter of much complaint on the part of those who have been unfortunate enough to come within the area over which the outfall smell has extended. When the original plans were submitted to the State Board of Health and the distributing system was approved (December 16, 1887), the method of discharge was noted as unsatisfactory and the village was then ordered to modify the point of discharge. On November 17, 1893, plans and specifications for a disposal plant were presented to the State Board of Health by the city for approval. The Consulting Engineer of the Board, Mr. John Bogart, reported, after examination of the plans and the local conditions that there was immediate need of a disposal plant, that sewage matter, paper and refuse from the sewers were carried by the flood tides in Hutchinson river above the outlet and were deposited on the low flat lands adjacent to the stream, that the continuance of such a condition of things would in his judgment be dangerous and detrimental to the health of the citizens of Mt. Vernon, and that the plans submitted would secure in an economical manner an effluent that would in no way injuriously affect the stream. The plant proposed was in effect a chemical precipitation plant using lime and bichloride of iron as precipitating agent. These plans were duly approved, but no steps seem to have been taken toward the construction of the works. In 1895 complaints were made to the Board because of the nuisance caused by the discharge of sewage from the western part of the city into the West Chester creek. But in view of the then newly appointed Bronx Valley Sewer Commission, whose labors might include caring for the sewage from this territory, no action was taken. In 1896, certain minor changes (relating to the location of the outfall sewer across the flat land between East Sixth street and Fulton avenue, and in the location of three of the lateral sewers), were approved by the board. On September 26, 1898, the board approved plans for a new outlet sewer, which proposed to intersect the former sewer at a point near the junction of Sixth street continued and the river, thus intercepting all of the city sewage including the Bronx valley sewage, which was to be pumped up over the ridge—and by a 36-inch sewer carry this sewage eastward into Long Island Sound at a point near Glen Island.

In 1901, no action having been taken to relieve the growing nuisance in the Hutchinson river, complaint was made to the State Board by some fifty residents and property holders on or near the Hutchinson river, protesting against the continued emptying of sewage into the river and alleging the existence of a terrible nuisance, and a great danger to the health of the inhabitants in that vicinity. Professor O. H. Landreth investigated the matter in behalf of the board, reported that an undoubted nuisance existed, and that it was clearly within the province of the State Board of Health to direct the city of Mt. Vernon to carry out the system of disposal or to procure and execute without delay some more modern and efficient system than that of chemical precipitation formerly proposed. No action, however, was taken, and nothing further seems to have been done until the city administration in 1908 undertook to remove this long standing reproach upon the city. This action was undertaken partly as a result of an investigation of the nuisance arising from the discharge of sewage into the Hutchinson river from Mt. Vernon, Pelham and Pelham Manor, made by this Department, a conference in the matter between the three municipalities and the Department, attended by representatives of the municipalities, and this Department, being held in January, 1906. Plans were prepared by Mr. George L. Robinson and Mr. John M. Farley for treating the sewage on an area of ground just at the mouth of the present sewers. The plant, now (1909) under construction, is of modern design and includes a receiving chamber, a distributing gallery, five sedimentation basins, and six downward jet sprinkling filters. The plant is located in the vicinity of a built up portion of the city, and involves some unique features intended to minimize any possible nuisance. The gases formed in the sedimentation tanks are forced by a motor to pass through a series of oxide of iron filters for the express purpose of eliminating the sulphuretted hydrogen. A similar filter for gases evolved from the sprinkler filters which are also roofed over is provided and it is believed that the operation of the plant will be so free from odor as to have no deterrent effect on the location of valuable residences in the immediate neighborhood. The problem of sewage disposal for the city may be thus considered solved after twenty years of discussion, so soon as the plant is completed, and when the laterals, urgently needed in many of the newly built streets, have been built, the sewerage system will have been satisfactorily completed.

Ice

The ice supply for Mount Vernon is largely provided for by the American Ice Company, which controls so largely the ice crop of that part of the State. The territory of Mount Vernon is handled as one of the districts of New York city and the same sort of ice is furnished in both cases. No definite information could be obtained as to the source of the ice delivered in Mount Vernon and it is probable that no uniform practice is followed, the cheapest and most convenient supply being used. There are, however, some other dealers and sources of supply.

The Pelham Hygeia Ice Company from Pelham distributed some small amount of artificial ice. No control over the ice supplied by either company is exercised by the city.

Water Supply

The water supply of Mount Vernon is far from satisfactory both as to quality and as to quantity. The system now in use was originally installed in 1886, the water coming from impounding basins on the Hutchinson and Mamaroneck rivers. The drainage area on the latter above the reservoir is fifteen square miles and on former six, a total watershed area of twenty-one square miles. There are four storage reservoirs with a total capacity of 113 million gallons. But there is a noticeable deficiency in the supply as might, indeed, be expected from the small watershed and limited storage. The works were built by a private company known as the Newport and Mount Vernon Water Company, and in 1892 it was absorbed by the New York City Suburban Water Company, since transformed into the New York Interurban Water Company. There are two reservoirs on the Hutchinson river, the upper one with about three square miles of watershed supplying New Rochelle with its population of 20,000. The overflow of this reservoir is held in the Mt. Vernon reservoir about a mile down stream with its watershed of five square miles. The New Rochelle pipe line crosses the Mt. Vernon conduit, so that a part of the flow to the former city can be diverted to the latter if desired. The water from the Mamaroneck reservoir is carried by means of a syphon across the divide and into the watershed of the Hutchinson river. A storage reservoir and filter beds have been built at Pelhamville directly to the north of the New York, New Haven and Hartford Railroad. Here is provided an aerating cascade, the water from the upper reservoir being brought in a pipe to the top of a rocky ledge and allowed to tumble over the rocks a vertical height of thirty feet onto the sand filter beds, which are one and a quarter acres in area, the water consumption being about 2,000,000 gallons per day. The drains lead to a pump well whence the water is pumped to a standpipe. The sand in the beds was roughly graded, all passing through an eighth-inch screen, and was twenty-four inches deep at the center of the beds and eighteen inches at the sides. These filters were the second ones built in the United States after the classical investigations of the Massachusetts State Board of Health (the Lawrence filter having been built one year earlier) and has done effective service for fifteen years. It is now overlooked, has become badly clogged and it was a matter of belief by many although not substantiated by the writer, that water from the Pelhamville reservoir, immediately adjoining the filters on the Hutchinson river passed directly to the pump well without passing through the filter.

The quality of the water leaves much to be desired. In the summer months there is a noticeable musty or earthy odor and a personal examination of the watershed shows many obvious sources of objectionable pollution. The contract between the water company and the city provides for a water of recognized purity as follows: "The furnishing of an adequate supply of wholesome, palatable water during the full period of the contract is the essence thereof, and if the same shall fail in quantity or quality from any cause except such as may be beyond the control of the said water company for a period of ten days after notice thereof served by the said city upon the said water company, this contract shall at the election of the said city be forfeited and become null and void." The contract was dated December 7, 1898, and was to run for ten years, or to December 8, 1908. The following analyses made by the State Department of Health show how far from being wholesome and palatable the water has been:

April 24, 1908

Raw water from reservoir near Pelham pump station, bacteria per c.c.	950
One out of five 1 c.c. samples positive for B. Coli.	

April 24, 1908

Mamaroneck river reservoir near intake, bacteria per c.c.	5,900
Sixty per cent. of 1/10 c.c. samples positive for B. Coli.	

April 24, 1908

Tap in engine-room between White plains and Mamaroneck filtered water, bacteria per c.c.	1,300
Three out of five 1 c.c. samples positive for B. Coli.	

Chemical analysis in parts per million:

Total solids	77.00
Loss on ignition	20.00
Free ammonia	.014
Alb. ammonia	.054
Nitrites	.004
Nitrates	.500
Chlorine	5.370

April 24, 1908

Tap at pump station, filtered water:

Total solids	84.00
Loss of ignition	28.00
Free ammonia	.016
Alb. ammonia	.054
Nitrites	.003
Nitrates	.600
Chlorine	4.740

June 20, 1908 — *Lederle Laboratories*

Tap in boiler-room at pump station, filtered water:

Total solids	100.00
Loss on ignition	34.00
Free ammonia	.030
Alb. ammonia	.045
Nitrites	.001
Nitrates	.600
Chlorine	4.850

An inspection by the writer of the upper end of the Mamaroneck river showed that objectionable sources of pollution, so great in amount and of such a character that only the most efficient filters could be expected to transform the water into a suitable water supply.

Silver lake, or St. Mary's lake, the headwaters of the river just above White Plains, is a popular resort for that city. The lake is shallow and dirty, has a number of rowboats for visitors, serves as drainage for a casino and lunchroom on the bank and evidently is much polluted.

A number of Italian houses on the edge of White Plains are unable to connect with the city sewers and their drain pipes discharge directly into a brance of the river. For a half mile the White Plains sewer and the small stream known as the river run side by side through low flats or marshy land, and it is said that at times the sewage has overflowed from the manholes into the stream, On a branch of the stream running by the pumping station of the White Plains sewer are a number of houses (about a dozen) which have privies directly on the bank or close to the stream. At the junction of this branch with the main stream is a small triangular lot, with a privy directly on the bank of the stream. In this same vicinity is a negro settlement, with a number of barnyards and pigpens all draining into this stream. Below White Plains the stream runs through agricultural land or large estates and is in good condition. It is inevitable, however, that the pollution of the upper part should find its way down stream to the reservoirs, and except for the effect of sedimentation appear on the filter beds. The report of the inspector of the Mt. Vernon board of health, a Mr. W. O. Comstock, shows that the board of health is awake to the situation, but since action must come from the water company their appreciation of the condition seems to have no value.

Extract from Report of Mr. Comstock

Going down the Mamaroneck river I find the conditions at the Old Mill and Deuterman's stables the same as I have previously reported and can find no evidence of any one doing anything to better them.

The conditions of the open drain behind the tenement houses at the corner of Lake street and Harrison avenue is, if possible, worse than before on account of the effect of the hot sun. This drain takes wash water and sewage from an unknown number of families in these houses.

As to the existing conditions farther down the tributary brook, they are the same as I have reported before, no changes being noticeable.

The negro settlements known as Blackberry row present the same conditions as before.

The village of White Plains garbage dump about two miles down the road has not been used since June 10th last, and upon inquiry was informed that this was due to the fact that someone's contract had expired and as soon as the new contract was made it would be in use again. But Mr. Perry, of the Water Company, tells me that he served notice about June 6th, so this may have had some effect. In recapitulation I would say that I find no betterment of any conditions anywhere since my report of July of last year (1907).

On August 1, 1887, rules and regulations for the sanitary protecting of Hutchinson river and the reservoir furnishing the public potable water supply of the village of Mt. Vernon were adopted by the board of health, and these rules have been added to from time to time, and amendments have been made looking to a better protection of the water. But they have not been made effective, largely through the unwillingness of the water company to undertake the necessary expense.

The water company has lately proposed adding to their supply by bringing into the city an additional amount from the Pocantico Hills through a 16-inch pipe, but at the time of the writer's visit, this was held up by difficulty over rights of way, in the city itself. During the session of the Legislature just past, 1908–1909, a bill was introduced to allow the city to tap the New York city main and take water therefrom, but this bill was vetoed by the Governor as being illegal.

The question of a suitable water supply for Mt. Vernon is therefore a most vital one for the city, and the thinking members of the community seem to be awake to the necessity of taking up the matter of an improved if not a new supply. Editorial comment in the Mt. Vernon *Daily Argus* has appeared, expressing a moderate view but one which seems to be entirely justified by the conditions. This article emphasized the fact that the city authorities have too little control over the sanitary quality of the water supply, and th the urgency of the situation justified immediate action by the authorities, possibly by the appointment of a commission to without pay, which should consider means for improving or ing the source of supply.

Summary

1. Mt. Vernon is a city of homes, with little or no manufacturing and affording suburban residences for New York city business and professional men.

2. The proportion of residents of foreign population is low, being about 25 per cent. at all ages, and 12 per cent. between five and twenty.

3. The general death rate per 1,000 population in Mt. Vernon for the eight years, 1901–1908 inc., is 14.1, which is lower than the death rate in cities generally. It is 4.0 lower than the average of all cities in New York State and 2.8 lower than the average of all cities in Massachusetts.

4. The average typhoid fever death rate is also low, averaging 17.4 per 100,000 population for the past eight years. The rate is not uniform, however, and reached a maximum of 37.8 in 1907.

5. The death rate of children under five is somewhat above the normal, both when compared with the total population and with the total number of deaths. In the former the average rate for the past eight years has been 52.0, and in the latter 34.9.

6. The milk supply is subject to some restriction by the local board of health, and inspection of some of the dairy farms has been made under their direction. Very bad conditions were found by the writer on one farm visited, and the irregular death rate from typhoid fever and the high death rate among children makes the continual purity of the milk supply questionable.

7. The method of garbage collection and disposal in vogue at the time of the writer's visit seemed satisfactory. Some complaint might be made of the details of collection, but this can hardly affect the health of the city.

8. The sewerage system is on the separate system, and except that the growth of the city makes the construction of the laterals lag behind the demand the distribution system is satisfactory. The method of disposal into the Hutchinson river has long been a public nuisance, but this state of affairs will be remedied when the sewage disposal plant, now under construction, shall have been completed.

9. The pavements of Mt. Vernon are extensive, generally in good condition and well kept. The city is constantly making extensions and presents the appearance of being well paved.

10. The ice supply of Mt. Vernon comes chiefly from the American Ice Company, and it was not possible to determine from which one of their many fields the ice supplied to Mt. Vernon is cut. No apparent jurisdiction over the quality of the ice is exercised, but it is not likely that the health of the city is affected, even should the ice come from fields not entirely satisfactory.

11. The water supply of Mt. Vernon comes from the Hutchinson and the Mamaroneck rivers and is filtered through slow sand filters. Analyses show at times excessive numbers of bacteria and the presence of colon forms. An inspection of the watershed by the writer showed unmistakable pollution. The quantity is at times insufficient and an addition to the present supply is urgently needed.

Conclusions

The writer is brought to the conclusion, after his personal visit to Mt. Vernon, after a tabulation of the mortality statistics of the city and a careful study of the same, that Mt. Vernon is an exceptionally healthy city and favored both by nature and by man in its location, in its development and in its municipal undertakings. The writer cannot, however, but regard with some anxiety both the water supply and the milk supply, and points out again that both may in a way be said to be under suspicion.

On account of the proximity to New York city, milk is distributed in Mt. Vernon by the same large concerns that also distribute in the larger city. In Mt. Vernon, however, they are subject to no inspection, or testing, or to any oversight except possibly an annual inspection of some of the dairies. It is manifestly impossible for Mt. Vernon to institute, as New York has done, a system of inspection to cover all the dairies from which the city supply may come, since the force of inspectors required would be altogether beyond the resources of the small city. To have inspectors to test the milk for bacteria, for fats and for solids woul
however, be unreasonable and would serve to deter mil
from selling in Mt. Vernon milk which might
a city where inspection was practiced.

The water supply, although often rep
" in good condition " or of " good qual
be distinctly unsatisfactory, and since

it is only possible to bring persuasive powers to bear in such a way that the water company will improve the present supply, both as to quality and quantity.

Appended hereto, is a map of Mt. Vernon, showing the relative position of the Bronx and Hutchinson rivers, with the outfall sewer shown where it discharges into the latter.

Respectfully submitted,

H. N. OGDEN,
Special Assistant Engineer

OSWEGO

ITHACA, N. Y., *November* 9, 1909.

MR. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— In accordance with your instructions, I beg to submit herewith a report covering my investigation of the sanitary condition of the city of Oswego.

History

The present city of Oswego, called by the early French settlers Chuaguen, was first settled between the years 1700 and 1710. Colonel Romer had explored the country of the "Five Nations" in 1700 and 1701 and reported that at the mouth of the Onondaga's river, the original name of the Oswego river, was a most suitable place for the erection of a fort. The settlement of Oswego, however, had no civil history until the surrender in 1796 of Fort Ontario to the American authorities. Up to this time it had been nothing more than a military trading post, and when the British finally disappeared they left few signs of a peaceful civilization. In fact there were no white persons at the place for a number of months after the evacuation by the British, and it was not until late in 1796 that the first permanent settler, Neil McMullen, located there.

From this time until the year 1804 the development of Oswego was slow. In the latter year, however, considerable advancement was witnessed, a road being cut through between Cato and Oswego. In the year 1807 there were about fourteen dwellings in the village on the west side of the river, a few of which were frame structures. At this time building operations were begun in earnest, and although the war of 1812 retarded progress somewhat, it was not long after 1812 before Oswego regained her former activities in business and building operations again went on with renewed vigor.

In March, 1816, Oswego became a county seat, and in 1818 the town of Oswego came into existence, embracing within its territory all of the village west of the river.

The Welland canal was opened in 1830 and this imparted a forward movement to the town, inasmuch as it greatly increased the commerce on Lake Ontario; and from this time on, during a period of forty years, Oswego prospered and grew by leaps and bounds, interrupted now and again by such occurrences as the destructive fire of 1830, which burned all the buildings on the east side of First street from Cayuga to Seneca streets and along Seneca to the corner of Second street.

In 1831 the Asiatic cholera ravaged portions of Europe and the next year the plague was reported in Quebec and Montreal. Naturally great excitement prevailed in Oswego, since it was a lake port, and, therefore, lay in the direct line of infection. However, the town authorities took immediate action, a strict quarantine was established, a general cleaning of the village and removal of all nuisances ordered, and at the piers guards were stationed to prevent vessels from entering the harbor. As a result of these precautionary measures Oswego escaped with a single case of cholera, although Syracuse, Buffalo and Salina suffered heavy ravages from the scourge.

During the period from 1831 to 1835 the population of Oswego climbed from 1,835 to 2,755. This period, therefore, was one of rapid development. The basis of this development, however, was unsubstantial since this was the period when speculation in land and other commodities was at its height, and soon after, namely, in 1837, occurred the panic which nearly destroyed the very existence of the city. However, the town recovered slowly but surely, and in 1848 was incorporated as a city. A little after this time complaints were made about the abnormally high rents, and on the strength of this many new business structures were erected with an accompanying advance in the progress of the city. Soon after this (1852) the population of Oswego was recorded as 14,300. In the next year occurred another fire which swept away a large part of the business portion of the east side. However, new structures immediately sprang up and business in the city continued to increase rapidly. Enormous cargoes of grain from the West found their way to the Oswego elevators and thence to the mills, to be converted into flour for the eastern markets. Building operations continued unabated. In 1855 the population was 16,000, in 1860, 16,816, and the rate of growth of the city scarcely slackened during the Civil War which followed during the next four years.

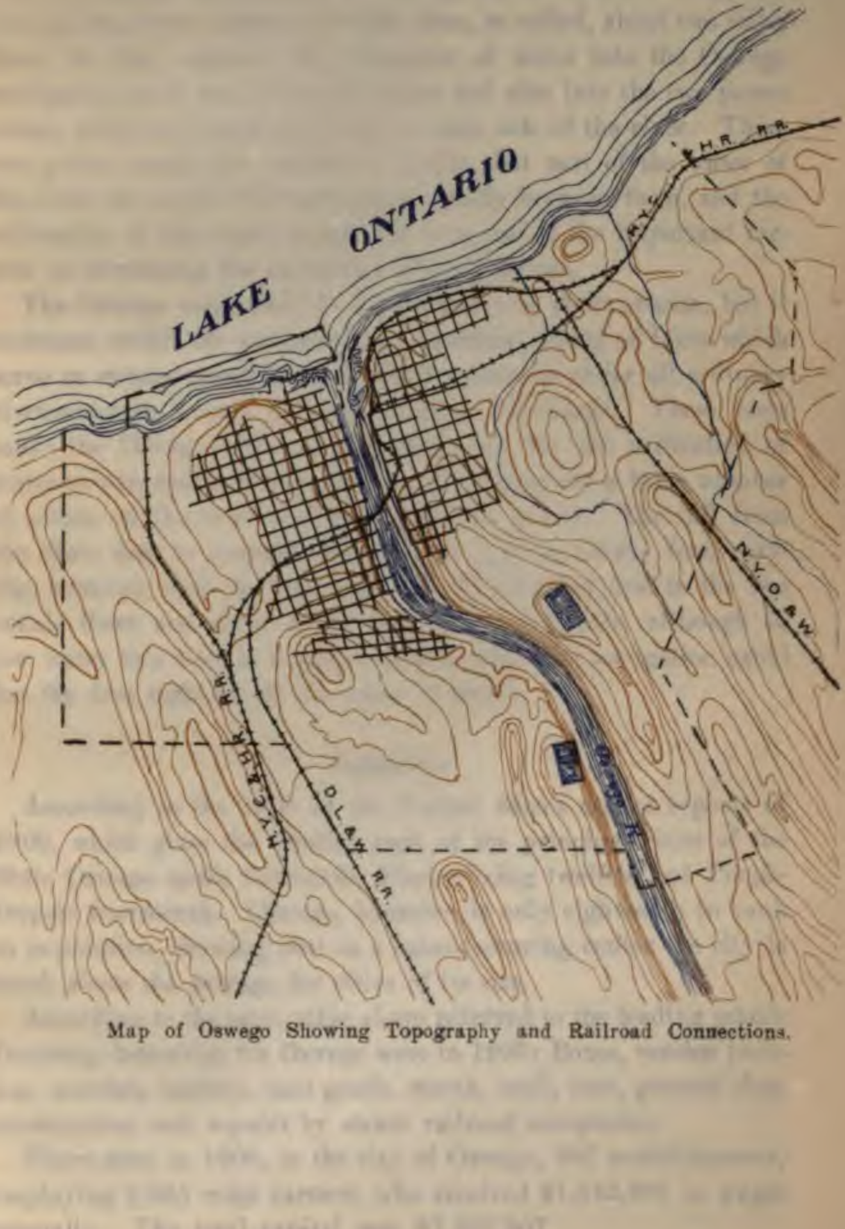
In 1871 a sewerage system was inaugurated and soon after this an iron bridge was constructed across the river.

In 1872 tolls were reduced on the Erie canal and in 1882 they were abolished altogether. These were the two most disastrous events occurring in the history of Oswego. Naturally the canal diverted much of the grain by way of Buffalo, and thus Oswego was left stranded on the shore of Lake Ontario, far removed from the main current of commerce.

The development of Oswego since the time when the immense amount of business it once had was turned into the Erie canal route has been slow and lethargic, and at the present time the city presents a rather deserted appearance.

Topography

The present city of Oswego is situated on the water front of Lake Ontario on both sides of the Oswego river, which divides the city into two nearly equal parts. The river forms an inner harbor and a breakwater over a mile long runs parallel to the lake shore, enclosing a large area which forms an admirable outer harbor. The banks of the river are steep, forming a veritable gorge in the vicinity of the water works, but decreasing in height as the river empties into the lake. A small stream on the east of the city flows northward into the lake and drains a large part of that side of the city. Similarly a second brook on the west drains a part of the city in the vicinity of the New York Central and Hud-



Map of Oswego Showing Topography and Railroad Connections.

son River railroad. The river has two dams within the city limits, the upper one, known as the "high dam," about fifteen feet high, the water power from which is used by the water board to operate the Oswego water works; the State dam, so called, about two miles from the lake, controls the admission of water into the Oswego navigation canal and so to the harbor and also into the two power canals which are constructed one on each side of the river. These two power canals are entitled to divide that part of the water of the river not needed for navigation equally between them, and the utilization of this water power has been one of the important factors in developing the industrial life of Oswego.

The Oswego river itself is a comparatively short stream, but it embraces within its watershed a magnificent group of lakes which serve as storage reservoirs and which maintain under all ordinary circumstances a very full and uniform discharge. These facts make the Oswego river an admirable one for the utilization of water power, and in consequence of this there are a large number of plants on the river making use of this power. The fall from the State dam to average lake surface is about twenty feet, varying, however, with the lake level. It is estimated that in the two canals there are about 4,000 horsepower available, although in low water this total is largely reduced, since the navigation canal has the first right to all the water it needs.

Industries

According to the table of the United States census reports of 1900, which gives the relative rank of the principal cities of the State Oswego ranks thirteenth, Elmira being twelfth, and Poughkeepsie fourteenth. Oswego, however, is only eighteenth in rank in population, showing that as a manufacturing center the city is much above the average for cities of its size.

According to the same table above referred to the leading manufacturing industries for Oswego were in 1900: Boxes, wooden packing, matches, hosiery, knit goods, starch, malt, cars, general shop construction and repairs by steam railroad companies.

There were in 1900, in the city of Oswego, 207 establishments, employing 3,845 wage earners, who received $1,512,905 in wages annually. The total capital was $7,344,907.

The following table gives the change in industrial conditions between the years 1890 and 1900:

Year.	Establishments	Capital	Wage earners	Value of products
1890	249	$6,254,200	2,867	7,482,378
1900	207	7,322,907	3,845	8,137,950
Per cent increase or decrease	16.9	14.5	34.1	8.8

The reduction in number of establishments here noted taken in conjunction with increase in capital, wage earners and value of products would tend to show that Oswego has not failed to follow in the wake of the larger cities, where the amalgamation of many small establishments into fewer large ones seem to be the general trend of business activities.

In 1848, Thomas Kingsford established in Oswego one of the greatest industries of its kind in the United States, namely the Oswego Starch Factory. Up to the time when this factory was established almost all the starch product was made from potatoes and wheat, and it was Thomas Kingsford who first became impressed with the probable value of our Indian corn for starch making purposes. He offered the suggestion to starch makers in 1841, but as is too often the case, his suggestion was treated as visionary. Undaunted, however, he began to experiment personally in the same year at the factory where he was employed, and continued his experiments during five years when he established himself in business at Bergen, N. J., in company with his son Thomas Kingsford, Jr. Soon, however, the great value of the new product resulted in the incorporation, in 1848, of the Oswego Starch Factory, T. Kingsford & Son, manufacturers, and the industry was removed to Oswego. The promoters of the industry were pursuaded to make this change of location on account of the unfailing water power, and the excellent shipping advantages to be secured at Oswego. The industry has had an almost unprecedented growth since its inception and the capacity of the plant has been increased from 1,327,000 pounds, in 1849, to over 25,000,000 in recent years. The present annual consumption of corn is about 1,000,000 bushels, and the plant easily earns the distinction of being one of the most extensive in the State.

Sociology

The conditions existing at Oswego in regard to congestion of population are markedly favorable to healthful living. Taking the statistics from the census of 1900, the total population is 22,199, the number of dwellings, 4,808, and the number of families, 5,055. This gives 4.6 persons per dwelling, 4.4 persons per family, and 1.5 families per dwelling. Since any congestion of population is marked by a large number of persons per dwelling, a value as low as 4.6 shows that there are few large tenement-houses and the similarity of this value 4.6, with the number of persons per family 4.4 shows that, generally speaking, each family has its own separate house. To emphasize the advantage which Oswego enjoys in this regard it is only necessary to point out that by the same census report there were in Schenectady 7.0 persons per dwelling and in Cohoes 8.1 persons per dwelling. It is self-evident, therefore that there is no tenement-house congestion in Oswego. From the standpoint of the number of children, however, there is one point that should be noted, namely, that the average number of persons per family in the United States is 4.7, whereas as above stated, the same figure for Oswego is 4.4. This would indicate that there are fewer children in the city than is normal in the United States, and later studies of the ratio of the deaths of children under five to total deaths will show whether or not this is further borne out. The large number of wage earners or operatives in the several mills, about one-fifth of the total population, give to the city certain characteristic elements. Although the modest houses, so general throughout the city, are largely owned by the occupants, who should therefore have an active interest in municipal improvements, it appeared to the writer, that, either, on account of the character of the citizens, or the small wages received, or on account of the adverse interest on the part of the absent mill or other property owners, a proper public spirit, devoted to the betterment of municipal conditions and the development of a clean, well-ordered and well-governed city, was noticeably lacking. The city water supply has been so bad for years that the typhoid death rate has been one of the highest in the State, in spite of the fact that a large number of citizens drank only bottled or spring waters. The board of health has not lived up to the full measure of its duties, and the fact that the city has almost ceased to increase in numbers may be either the cause or the effect of this general indifference to the public welfare. During the five years 1900–1905, Oswego gained in population 373 persons, while Amsterdam gained 3,014 and Watertown gained 3,751, both these latter under similar conditions apparently, and of the same size as Oswego. In the 15-year period 1890 to 1905 the contrast is even more striking. Oswego in that time gained 730 persons, while Amsterdam gained 6,607 and Watertown 10,722. Since a city which does not grow may be said to be already going to decay, and since a growing city can maintain its growth only by a judicious and constant outlay for municipal improvement, it would seem to be necessary, if Oswego is to develop as her splendid water power should encourage her to do, for the city to arouse herself to more modern ideas of municipal housekeeping, and make herself into a new city, with due recognition of her present sanitary needs.

Mortality Statistics

The general death rate of Oswego shows an average value of 16.3 per 1,000 population, as will be seen by the following table:

Year	Population	Deaths	Rate per M
1900	22,199	421	18.9
1901	22,273	334	14.9
1902	22,348	324	14.6
1903	22,423	324	14.5
1904	22,497	391	17.4
1905	22,572	406	17.9
1906	22,646	376	16.6
1907	22,721	360	15.8
1908	22,795	376	16.5

For purpose of comparison the following table of general death rates in various countries is given:

United States registration area	15.9
Norway	14.5
Sweden	15.5
England and Wales	16.0
Switzerland	17.7

France	19.6
Germany	19.9
Italy	21.8
Austria	24.1
Spain	26.1

Average, 19.1

Thus it is seen that while Oswego has about the same general death rate as the United States registration area it has, nevertheless, a lower rate than the average for the nine countries considered, and the only countries which have a lower death rate outside of this country are Norway, Sweden and England. There is, therefore, no glaring abnormality in the general death rate of Oswego. However, this should be no cause for congratulation in the matter of specific death rates. Nor is it conclusive, unless it is found that the living conditions in Oswego are entirely normal. Since the number of deaths of children under five is large, constituting about one-third of all the deaths in a city, it follows that if the number of children is small, the death rates among the adults might be apparently low, compared with the rate in another city where there were the normal number of children, and yet the condition of health among the adults might be far from satisfactory. Again, a failure on the part of the authorities of a city like Oswego to report every death would apparently reduce the death rate and give a feeling of confidence entirely misleading. Again, a factory city, with a comparatively large number of operatives, male and female, in their prime of life, and unmarried, should have a low death rate compared with other cities, even though the actual sanitary conditions were far from good. Some light may be thrown on the significance of this apparently low rate by reference to death rates from specific diseases and it will, therefore, be pertinent to investigate such death rates as, for instance, the typhoid fever death rate and the death rate of children under five.

The following table gives the typhoid fever death rates for the city of Oswego for the period 1900–1908, the number of deaths being taken from the bulletins of the New York State Department of Health and the population for the various years being interpolated between the census reports of 1900 and 1905:

Year	Population	Deaths	Rate per 100,000
1900	22,899	10	45.0
1901	22,273	5	22.4
1902	22,348	4	17.9
1903	22,423	12	53.5
1904	22,497	14	62.2
1905	22,572	19	84.0
1906	22,646	12	57.5
1907	22,721	15	66.0
1908	22,795	14	61.4

This gives an average of 52.2, a rather startling figure after the complacency which would be reached by a mere contemplation of the general death rates. The average typhoid rate in the United States is 32., or about half the Oswego rate. Still more forcible is the comparison of the Oswego typhoid rate with the same rate for Switzerland, viz., 6.2. Further, in the range of the period of years above referred to there has been an increase rather than a decrease in the typhoid rate. This should be an incentive for immediate action on the part of Oswego.

The following table gives the death rates of typhoid fever in a number of countries, including the United States registration area referred to above, as well as Switzerland. From this table it will be seen how abnormally high the average typhoid rate in Oswego is, when compared with rates prevalent in a large part of the world:

COUNTRY	1902	1903	1904	1905	1906	Average 1901–5
U. S. Registration, area	34.4	34.2	31.9	28.1	32.1	32.2
Australasia	20.5	25.5	15.5	13.7	15.7	19.0
Austria	18.1	19.7	19.3	......	......	19.9
Belgium	17.8	15.6	14.9	13.7	......	16.8
Germany	7.0	7.3	7.0	6.3	......	7.6
Italy	34.6	35.5	36.9	32.7	28.1	35.2
Japan	11.4	9.8	10.8	13.2	......	11.6
Spain	45.8	43.4	44.4	37.7	42.2	44.5
Sweden	10.4	5.3	5.1	......	......	8.3
Switzerland	6.0	5.0	7.7	5.0	......	6.2
England and Wales	12.6	10.0	9.3	8.9	9.2	11.2

There is, therefore, no doubt as to the imminent necessity of preventive measures against the ravages heretofore perpetrated by this disease upon the citizens of Oswego, and the lamentable quality of the public water not only discredits the general rate but suggests an answer to any question as to the slow growth of the city.

The study of the death rates of children under five very often makes possible a number of valuable deductions. The table of these death rates, taken from the reports of the New York State Department of Health, follows:

Year	Population	Deaths	Rate per 10,000
1900	22,199	98	44.2
1901	22,273	69	30.9
1902	22,348	50	22.4
1903	22,423	59	26.3
1904	22,497	71	31.6
1905	22,572	98	43.4
1906	22,646	93	41.2
1907	22,721	80	35.3
1908	22,795	95	41.7

This table gives an average of 25.2 deaths annually per 10,000 population. That this is a very low death rate for this age period will be seen from the following table, and the fact that the normal death rate for children under five in the United States registration cities is 49.6 (U. S. Census Report):

DEATH RATES OF CHILDREN UNDER FIVE IN ENGLAND DURING THE PERIOD OF 1840–80, INCLUSIVE.

Year	Rate
1841–1850	66.15
1851–1860	67.58
1861–1870	68.30
1871–1880	63.12

This table precludes any doubt as to the death rate for children under five in Oswego being otherwise than low. This apparently low rate gives rise to two possible inferences, namely: either the conditions of living and the environment in Oswego are really such as to promote the healthful development and growth of children; or, there are in Oswego fewer children than is true of the majority of the communities from which the above higher rates were taken. It will be remembered that scarcity of children was previously referred to under "Sociology," and the low death rate for the children just considered merely gives an added weig to the surmise that there are few children in Oswego.

It might also be of value in this connection to investigate t ratio of deaths under five to total deaths, as the fact that th ratio was low or high would also point to the fact that the numb of children in Oswego were few or many. The table giving th ratio for the period 1900–1908 follows:

Year	Deaths	Under five	R
1900	421	98	2
1901	334	69	2
1902	324	50	1
1903	324	59	1
1904	291	71	1
1905	406	98	14
1906	376	93	14
1907	360	80	2
1908	376	95	25

Average 21⅓%.

This table gives an average ratio of 21⅓ per cent. for th period of years referred to. In cities of the United States whe the proportion of children is normal, we have a ratio of abou 30 per cent., which fact makes the corresponding ratio for Osweg considerably lower than is the case in the majority of cities i the United States. This low ratio, therefore, again argues i favor of a small number of children in Oswego, and hence w have three evidences pointing in that direction. It is fair t assume, therefore, that this conclusion is warranted. This as sumption, then, would give room for doubt as to the validity o the apparently low death rate of children under five.

Summarizing the results of the studies of mortality, therefore, it is seen that the general death rate, while apparently low, may nevertheless be invalidated by conditions of living which are peculiar to Oswego, and since it is a well established fact that for each death from typhoid there are at least four other deaths from contagious and preventable diseases, and since, in fact, the typhoid fever death rate for Oswego is very high, averaging sixteen deaths per year for the past six years, and since this implies sixty-four other deaths, chiefly among children, it is seen that there are about eighty deaths in Oswego annually which may be called preventable, deaths which, in spite of the low general death rate, argue that the sanitary condition of the city is not good. And, while the death rate of children under five and the ratio of deaths under five to total deaths are both low, they are probably so on account of the preponderance of adults in the population, which invalidates their apparent significance.

It will not be desirable to investigate some of the possible causes for high death rates in the city of Oswego, and at the same time ascertain how carefully the health and comfort of the population is looked after by the municipal authorities.

Milk Supply

The quality of the milk supply for Oswego is not subject to any municipal oversight, although the milk ordinances assume that such oversight will be exercised. Milk regulations were adopted by the board of health on March 22, 1900, which, if carried out, would insure a good quality of milk, but unfortunately no adequate machinery has been provided to enforce the provisions of the regulations. The first regulation requires every person selling or delivering milk in the city to register with the clerk of the board of health, giving his name and address, and the name and address of all the dairies where the milk is produced. Provision is made in subsequent paragraphs for the revocation of the license, in case milk is taken from a dairy not denominated, in the application, in case the milk is watered or adulterated, in case the inspector finds milk taken from diseased animals after its prohibition, in case the premises are not clean and the milk properly cooled, and in case the examinations of the milk itself shall show the same to be deficient in fats or total solids.

Unfortunately these excellent regulations are practically dead letters, for while the city has had a veterinary inspector assigned to this work, there was no evidence, so far as the writer could ascertain, that any real attempt had been made by him or by the board to inspect and maintain a good quality of the milk. A report was made by the veterinary inspector under date of April 30, 1909, giving a list of fifty-two dairy farms visited, the date of the visit being omitted, with brief comments on the condition of each, but without specific statements of objectionable featu criticized by the inspector. An inspector of the Departme under date of September 17, 1908, visited some of the farms, a writes suggestively: "Of the six farms visited, only one co remember having received a visit from the inspector in over year and the one mentioned admitted that the inspector w called there to attend an ailing cow and was paid for this serv by the dairyman." The writer examined eight dairies at time of his visit and found some of them so inexcusably dirty to make certain the inefficient inspection of the city official.

The barn floors were of wood, half-rotted, reeking w manure, the barn yards were pools of muck, and milk roo were ill-ventilated and dirty, and the facilities for supplying water so entirely inadequate as to make the routine of washi bottles in hot water a farce. Not all the dairies were found this condition, a few having concrete floors, whitewashed wa and ceilings, and ample cooling and washing facilities, but e dently this is due to the dairyman himself and not to the ergetic inspection and to the support of the local board. It shou be added that there has been recently appointed a new inspect for milk and meat who is entirely without experience in su matters and who has had no instruction in what constitutes sanitary dairy. Without the list of dairies, or licensed deale he is in no position to make inspections, and has no authority make improvements even if he were certain to advise reasonal and necessary changes. The matter is in the hands of the loc board of health and the failure to assume the proper responsib ity rests entirely with them. It is to be hoped that conditio may change and that they will soon be aroused to a fuller sen of their duty.

Garbage

The garbage of Oswego is collected and disposed of by i dividual farmers and scavengers without any apparent oversig from the municipal authorities. It was said that a large amou of garbage so collected was fed to hogs on the outskirts of t city, but the writer was unable to find any large piggeries f which garbage was regularly collected. One farm on the e side, near the driving park collects a small amount of swill whi

is spread out on the ground and picked over by a flock of chickens. Two farms on the west side on the Boulevard, collect one load a day each, feeding to from twelve to twenty hogs. There is no large concern which collects in quantity and which may be said to take the place of a municipal organization. There are two city dumps, one on the west side in the vicinity of Mohawk and Tenth streets, and the other on the east side in the vicinity of Oneida and Eleventh streets. Both of these dumps are without supervision and in close proximity to dwellings. Organic matter of all sorts is left on these dumps, and the odors, even at the time of the writer's visit, when everything was very dry, was very noticeable. In wet weather, the odors must be very repulsive and they were so characterized by residents in the vicinity. If the dumps are to be continued the city should station a responsible man at each dump to see that the garbage subject to decay is properly covered and that the surface of the dump is kept smooth so that the filling may be uniform.

Dead animals, bones, market scraps, etc., are carried to a rendering establishment about two miles from the city on the east where the usual by-products are worked out. This place is a model of cleanliness and it is a pleasure to bear witness to the results of the owners' evident pride in the establishment.

Sewerage

The sewers of Oswego constitute a most extraordinary combination of assorted sizes discharging at haphazard into any convenient topographical depression. They date from early times, one on the east side having been built in 1855, and two or more on the west side, in this same decade. Four lines discharge into the river, and other large sewers on each side discharge into brooks which in turn discharge into the river or the lake. There is very little concentration of the sewage but a separate sewer serves a few blocks and is then led to a brook or to the river. The sewers are generally on the combined plan, although there are a number of 6-inch and 8-inch sewers on single blocks. The city engineer has recently completed plans for a trunk sewer for the territory draining into Harbor Brook on the east side, and the plans have been approved by this Department for this sewer, which, if constructed, would relieve the stream of its excessive load of sewage. The permit issued in connection with the approval of the above plans provides for proper treatment of sewage when required by this Department. This creek, in summer, is practically dry except for the sewage it contains and overflows from privies and cesspools intensify the odors which emanate from the sewage. The ditch contains also a miscellaneous collection of rubbish of all kinds, including kitchen refuse and dead animals, in more or less advanced stages of decay. It is desirable in the extreme that this sewer should be built and the creek with nauseous odors obliterated.

The stream in the western part of the city is in nearly as bad a condition on account of three large sewers discharging into its small volume, one at Bridge street, one at Cayuga street, and one at Seneca street. The city engineer is now engaged in making studies relative to the intersection of and treatment of the sewage collected by sewers on the west side of the river.

Pavements

In the matter of pavements, Oswego is markedly deficient. On the east side, Bridge street is paved from the river to Ninth street, a distance of 2,800 feet, with 2,000 feet on First street, a total of 4,800. There are also about 3,000 feet of brick and stone pavement on this side. On the west side there are about 8,000 feet of asphalt pavement and 4,000 feet of brick, a total of about 4.0 miles of pavement, out of about 85 miles of street. There are also 1.8 miles of macadam. The asphalt streets are in some places good and in others, full of holes and bad. The dirt streets are cleaned once a year, in the spring, the gutters being then scraped and the street surface rounded up. For the rest of the year they take care of themselves and since drainage from the houses is in places allowed to run directly into the gutter, the stagnation and decomposition resulting in the clogged-up gutters becomes most objectionable. The paved streets are cleaned twice a week, twelve men with two teams being employed. For this cleaning, large wide scrapers are used, which peel off the top of the street filth and which leave the finer particles to dry and become disseminated by the wind.

Ice

The ice supply of Oswego comes from two sources, the Spring Brook Ice Company and the Peerless Ice Company being the two dealers. The first cuts from an artificial pond formed on a small brook flowing into the lake in the northeast corner of the city. At the time of the writer's visit there was no water in the brook or in the pond, so that the quality of the water could not be judged. The watershed, however, was inspected and seemed to be free from pollution, except that the brook flowed through pasture land. It was said that the brook is formed by the overflow of the Crystal Springs, but evidently the pond must depend largely on the surface run-off from the immediate vicinity. This concern cuts ice also from the river, which it is claimed is used only for icing cars. The Peerless Ice Company cuts ice from a pond in the vicinity of Oswego, about seven miles to the southwest. This pond is surrounded by wilderness, is fed largely by springs and is an ideal source of ice supply. In fact, it is pleasant to point out among the many criticisms which must be made of the municipal undertakings in Oswego that in this one there is no criticism, but rather unqualified approval.

Water Supply

The city of Oswego has for many years had the doubtful honor of having one of the worst public water supplies in the State. Inasmuch as a pure water supply is the first line of defence to be formed against the ravages of typhoid fever, and since conversely a high death rate from typhoid fever is almost certain proof of a contaminated water supply, the fact that Oswego has had an average rate of 52.2 for the past nine years and of 64.1 for the past six years emphasizes the conditions as nothing else could. Cohoes and Niagara Falls have been even more indifferent than Oswego, since their death rates have been higher, and it is pleasant to record that all three cities are now actively engaged in improving their old supplies. In the case of Oswego, a 30-inch intake pipe is being laid out into the lake a distance of 8,800 feet, at which distance it is expected that a pure unpolluted lake water will be found. A 20-inch main has been laid down to deliver this water from the intake pipe into the former mains of the present system, the old east side reservoir being retained to act as an equalizing basin and as storage in case of accident. The distribution system ext generally throughout the city but the pipes are small when protection is considered. Tests made by the Board of Fire U writers in July, 1908, on twelve groups of hydrants, showed in every case the discharge was limited by the size of the and that the distribution system was "entirely inadequate. was hoped that the improvements referred to above, includi new pumping station with two pumps, one 4,000,000 and o 000,000, would be completed early in 1909, but at the time o report (September, 1909), the intake is not finished nor ha river crossing been completed. Meanwhile, in spite of the consumption of spring waters, the effect of the present pol water supply is to give a death rate of 60–80 per 100,00 15–20 deaths and about 150 cases of typhoid in the city each

Summary

1. Oswego is essentially a manufacturing city, enjoyin benefits which come from the possible development of about horsepower.

2. The housing conditions of the city do not indicate a cong leading to a high death rate. The foreign population among a high death rate is usually found, is not large and yet it is mated that the Irish Catholics, the French Catholics, the Ge Catholics and the Italian Catholics make up more than hal population.

3. The general death rate in Oswego is 16.4 per 1,000 popul for the past nine years, which is a little less than a normal rat cities of this State (18.1 for the five years 1900–1905, and for the year 1907). This is not, however, an index of the san condition of the city.

4. The typhoid fever rate is excessive, and is generally bel to be due to the polluted water supply, now in process of imp ment. The average rate for the past six years is 64.1.

5. The death rate of children under five is not high, bu value of this rate is disqualified by other conditions.

6. The milk supply is not properly looked after, and the in tion of the writer shows that some farms have collections of

so placed with respect to the milk that freedom from pollution is hardly possible.

7. The method of garbage collection is most inefficient and unsatisfactory, and shows no concern of any sort on the part of the municipal authorities for its regularity or for the proper disposal of the garbage.

8. The sewerage system is on the combined plan and discharges the sewage into creeks, the river, and the harbor. The present system of sewers is the result of gradual development, and with few exceptions is chaotic in the extreme, without system or plan.

9. The pavements in Oswego are limited in extent, not always in good condition, and the methods of cleaning, while cheap, are not efficient from a sanitary standpoint.

10. The ice supply comes from two ponds, one of which is in a wilderness far removed from all possible pollution, the other has no evident signs of pollution and may be considered good.

11. The water supply of Oswego now comes from the Oswego river and is without doubt badly contaminated. Work is now under way on an intake extending into the lake a distance of 8,800 feet, at which point it is hoped a pure supply will be found.

Conclusions

The writer is brought to the conclusion, after his personal visit to Oswego, after a tabulation of the mortality statistics of the city, and a careful study of the same, that Oswego, in so far as sanitary matters are concerned, has not kept pace with modern knowledge and methods, and has been sadly remiss in looking after the health of its people. It is hard to see whether this is due to lack of knowledge on the part of those in authority, to their carelessness and indifference, or to their wilful disregard of matters not directly affecting their own individual interests.

In order to improve present conditions the writer suggests the following:

1. The inspection of the milk supply should be made in fact and should include (a) immediate registration of all dealers with a record of the dairy farms of which the milk they handle is taken, (b) an inspection and scoring of all such farms with a strict exclusion of the milk from those which do not reach a certain per-

centage, from being delivered in the city, (c) sampling of the milk from the wagons as delivered to the houses with a fine or other penalty in case of milk found adulterated or deficient in fats or solids.

2. The city should organize a municipal system of garbage collection so that city teams, acting under the direction of the board of health, should remove garbage from all hotels, stores and private houses at least twice a week. This garbage should be disposed of by burial, also under the care of the board of health, who should have men on the dumps continually to see that no organic matter is left exposed to the air.

3. The sewerage system calls for a considerable revision, bringing together the several outlets, taking the sewage out of the creek and removing the present outfall to a point such that the present stagnation in the lower river shall be done away with. In respect to revisions of the sewer system on the west side of the river in order to provide for protection of the water supply, a complete separation of storm water and sanitary sewage should be provided for in this section and provisions should be made for adequate treatment of sanitary sewage.

4. The pavements of the city are sadly inadequate and a regular systematic scheme should be developed for adding to the present mileage as rapidly as the resources of the city will allow. The present method of scraping off the grosser dirt from the pavements should be changed so as to either sweep or wash the pavements and remove the dust which is now so offensive. It is not possible to draw any conclusions as to the water supply, since it is now in a condition of change with the improvements authorized not yet completed.

Respectfully submitted,

H. N. OGDEN,

Special Assistant Engineer

PORT CHESTER

ALBANY, N. Y., *June* 1, 1909.

MR. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report covering my investigation of the sanitary condition of the village of Port Chester.

History

The present village of Port Chester, at the mouth of the Byram river, was settled early in the sixteenth century, and was first known as " Saw-pit." It derived this original name from the fact that a part of the village of Port Chester had been formerly engaged in the building of wooden vessels and was conspicuous for the accumulation of chips, sawdust and similar refuse. As early as 1732 there was a landing at this place known as Saw-pit Landing, and in 1741 we hear of " some small lots laid out at the Saw-pits so called." However, it can scarcely be said that a village existed at this place until nearly the time of the Revolution. Up to that time the maps of the place did not indicate more than half a dozen houses between Regent street and Byram bridge.

" Saw-pit " had as a visitor in 1824, General La Fayette, who was on his way to New England, coming from New York. He was met by " a large party of gentlemen on horseback," a salute was fired by the inhabitants and general jollity prevailed in honor of the event.

The Westchester turnpike road was laid out in 1800 and made quite a change in the appearance of the village of Saw-pit. In 1837, after the lapse of more than 100 years, Saw-pit changed its name to Port Chester, by which the village is now known.

The growth of the village has been slow but steady ever since the close of the Revolution. It possessed considerable trade between 1800 and 1840, since it was the market for a very good agricultural region. The situation of Port Chester was very favorable for the trade of the farmers in the interior, and hence they were induced to bring their produce to that harbor and at the same time make their purchases at the village stores. Another advantage was the "easy descent" of the roads leading into Port Chester from the surrounding region.

About the year 1798 Mr. Jared Peck, a very energetic and tactful man, came to Saw-pit and settled there, entering into business. It is to his enterprising spirit, more than to any other cause, perhaps, that Port Chester owes its development from that period. He bought up grain and other crops from the surrounding country, packed pork and beef and transported these products to New York city. This drew an inceasing traffic to the point and four market sloops ran weekly to New York city as a consequence.

Mr. Peck became the proprietor of several mills on the Byram river and as early as 1820 was interested in a cotton factory at Glennville, which is a village situated three miles above Port Chester.

For some time previous to 1820 a steamboat ran from New Haven to the eastern side of Byram cove, and here passengers westward bound to New York were obliged to land and take their way overland from that point for the remaining part of their journey. Stages ran to New York from Byram cove and passed through Saw-pit.

After 1837, at the time the change in name occurred, a significant change made itself evident in the character of the place. The exports of the products of the surrounding territory diminished since much of the trade had been diverted into other channels, and, moreover, as the village grew it needed more for its own consumption. Another reason for this decrease in exports lay in the fact that the land in the lower part of Westchester county was proving valuable for other than agricultural purposes and since the West had become a great source of supply for the metropolis, the farmers, as they could not hope to compete successfully with the low prices due to the large scale of operations there, raised less for export than formerly. It is due to these various reasons that Port Chester now imports largely from the city instead of exporting any of its products.

Topography

Port Chester lies on the west side of the Byram river, which forms the boundary line between New York and Connecticut. It is almost directly north of and across Long Island sound from Oyster Bay and distant therefrom about six miles. On the east side of the Byram river is a suburban territory known as East Port Chester, running out to Byram point at the very entrance to the harbor. Owing to the long peninsula known as Rye Neck, which extends well to the south from Port Chester on the west side of the Byram river, the coast line at this point runs nearly due north and south, which is also the direction of the Byram river. The ground is comparatively flat and level, the average elevation of the village being about forty feet above tidewater. The New York, New Haven and Hartford railroad runs directly through the center of the village and interurban trolley lines connect Port Chester with other suburban places east and west.

A small brook in the western part of the village, running from north to south, forms a drainage basin of some importance in the consideration of sewerage questions and in the location of ice ponds, both matters being referred to later.

Industries

In the matter of the manufacturing and labor statistics in Port Chester, the United States census report of 1900 gives as the number of establishments in Port Chester 79, with a total capital employed of $3,024,814, as against Corning with 135 establishments and $2,212,190 capital, or Hornell with 154 establishments and only $1,952,072 capital, other places of New York State of about the same size. This would indicate that Port Chester is rather above the average in manufacturing. The value of the products for Port Chester is given as $3,840,732, as against $2,535,151 for Ithaca, and $2,873,670 for Hornell, Ithaca also being about the same size as Port Chester.

The following table shows the number of men above sixteen years, the number of women above sixteen years, and the number of children below sixteen years, employed in Port Chester, Hornell and Ithaca, respectively, for the year 1900:

TABLE SHOWING THE NUMBER OF EMPLOYEES OVER AND UNDER SIXTEEN YEARS OF AGE IN THREE CITIES

	Men over 16 years	Women over 16 years	Under 16
Port Chester	905	628	36
Hornell	1,308	436	13
Ithaca	1,116	169	1

Port Chester is, in size, somewhat smaller than either of the two other cities, yet employs nearly three times as many children as Hornell, a fact which may be rated as an unfortunate condition in so far as it affects the death rate among children.

The industrial rating of the city is not given in the United States census report as its population is less than 20,000.

The principal manufacturing establishments in Port Chester are as follows:

E. Simons Manufacturing Company.
R. B. & W. Bolt and Nut Company.
Abendreth Foundry.
Port Chester Chemical Company.
Geo. Merte's Sons.

Sociology

The village of Port Chester, while in some respects similar to other suburban residence districts in the vicinity of New York, and possessing as do these others, handsome villas and extensive grounds, has at the same time a large percentage of foreign population and a marked tenement-house congestion. The figures for Port Chester, taken from the United States Census Report for 1900 show 2,530 males and 2,800 females native born, or 5,330 in all, as against 1,079 males and 1,031 females foreign born, or 2,110 in all. This is a ratio of foreign born to native born of 39.6 per cent. In Corning there were in 1900, 9,651 native born and 1,410 foreign born, a ratio of 14.6 per cent. This would indicate that there is an excessive proportion of foreign born inhabitants in Port

Chester, which fact may throw some light on subsequent studies of mortality.

The shores of the sound are noticeably selected for the sites of homes for wealthy city families, and on each side of the village, extending almost into the village itself, are large, well kept, fenced-in grounds with handsome buildings almost hidden behind shrubbery and flower beds. The village itself, however, contains a number of factories, which have been mentioned under "Industries." The growing importance of these factories has led to a large number of foreign workmen and common laborers, crowding together in one section of the city. Then again, the proximity to New York city, and the fact that a colony of Italian, Polish and other foreigners is already established in the village leads to a constant influx of immigrants, who always seek their own kind.

For the fifteen years 1875–1899 the death rate was as follows in Hungary, Italy and Spain (63d An. Rept. Registrar General, Eng.)

Hungary	26.9
Italy	23.7
Spain	29.4

If, therefore, the rate should hold after immigration to this country, a large proportion of such immigrants would obviously tend to raise the death rate. This throws a clear light upon what effect the presence of 39.6 per cent. of foreigners very likely has upon the death rate of Port Chester. For instance, suppose the death rate among the original native population of the village were 15.0 per 1,000 population and the death rate among the foreign immigrants were the average of the above rates, namely about 27.0. If, then, these were about 40 per cent. foreign inhabitants and 14,000 population altogether, the total number of deaths per year among the native population would be 126, and the total number of deaths per year among the foreigners would be 151.2. Hence among 14,000 inhabitants there would be 277 deaths, or a rate of

19.8, which is greater than the present average general death rate in Port Chester (17.0). It will be seen from this, therefore, that it is entirely possible for the foreign-born population to so affect the general death rate as to make an apparently excessive death rate a reasonable one, assuming the foreign death rate to hold after immigration to this country.

According to the report of the United States census for 1900 the total population was 7,440, the total number of dwellings 1,228 and the total number of families 1,661. This gives 6.05 inhabitants and 1.35 families per dwelling. This would indicate that there is, on the average, not much, if any, tenement-house congestion, although the congestion is greater than at either Corning or Hornell, where there are 4.6 and 4.37 persons per dwelling, and 1.09 and 1.11 families per dwelling, respectively.

Mortality Statistics

Past experience teaches that in making a study of the sanitary conditions pertaining to any region the table of general death rates, although not infallible, nevertheless gives in most cases a very fair idea of the summation of all the conditions, good and bad, by which the city is surrounded.

The table of general death rates for Port Chester follows:

TABLE SHOWING GENERAL DEATH RATES IN PORT CHESTER PER 1,000 POPULATION FOR 1900–1908 INCLUSIVE

Year	Population	Deaths	Rate per M
1900	7,740	147	18.9
1901	8,432	162	19.2
1902	9,123	163	17.8
1903	9,815	147	15.0
1904	10,506	165	15.7
1905	11,198	166	14.8
1906	11,889	180	15.1
1907	12,581	204	16.2
1908	13,273	173	13.0

Average = 17.0.

As will be noted the average general death rate for the village of Port Chester is 17.0. That this is too high will easily be seen by comparison with other cities of the same size in the United States. The United States Bureau of Vital Statistics gives a list of sixty-three cities in this country, the accuracy of which records it considers satisfactory, i. e., it puts them in the registration area of the United States. The average result of the death rates of these cities has been computed by the writer to be 16.2. This suggests that the general death rate of Port Chester, 17.0, is too high. However, the ratio of 17.0 to 16.2 does not give one a fair idea as to how much too high it really is. A much better idea can be gained by comparing the death rate in Port Chester with the rates of other cities where the conditions are more nearly normal than in a large number of the sixty-three cities above referred to. For instance, Corning, having a population in 1907 of 14,497, has an average death rate for the years 1900 to 1907 of only 15.4 per 1,000 population. Mt. Vernon, with a population of 27,272, in 1908, has an average annual death rate of 14.1 per 1,000 population for the period of 1900 to 1908. It has been shown in a report on Mt. Vernon, made by the writer that even this rate of 14.1 could be reduced were stricter measures taken to protect the city from disease. If, therefore, Corning's average general death rate, 15.4, be taken as a basis for comparison, and, taking the difference between 17.0, the rate for Port Chester, and 15.4, the rate for Corning, we find that on the average 1.6 unnecessary deaths per thousand occur every year in Port Chester. Or, taking the total population in 1908 as 13,273, it is found that were the conditions in Port Chester improved only up to the standard of Corning, the number of lives saved every year would be 21.2. The comparison indicates the immense importance of a proper sanitary supervision of a community, considered in a wide-awake, intelligent manner, instead of indifferently, as seems to prevail in the greater part of the country. The saddest part of it all is that the lower classes suffer most from such indifference. The class of people which does not know enough to better its own conditions, and which, realizing the limits of its intelligence, puts men presumably wiser than themselves in charge to better these conditions for them, has unfortunately often misplaced the trust. Either the public servants in charge have not the assumed superior knowledge, or they are too indifferent to make use of it.

It is presumably among the foreign population, not accustomed to sanitary precautions, and inheriting high mortality rates that the remedy must be applied. Forty per cent. of the population is foreign born, and if the death rate among this class can be reduced to the normal American value, the result would show in a much reduced general death rate. But as long as the municipal authorities maintain only a perfunctory concern in the health of the tenement-house population, the death rate will continue high and the reputation of the village suffer.

Turning, now, to the records of typhoid fever, we have the following table:

TABLE SHOWING THE TYPHOID FEVER DEATH RATE PER 100,000 POPULATION IN PORT CHESTER FROM 1900–1908 INCLUSIVE

Year.	Population	Deaths	Rate per 100,000
1900	7,740	2	25.9
1901	8,432	2	23.7
1902	9,123	3	21.3
1903	9,815	5	50.9
1904	10,506	9	85.7
1905	11,198	10	89.9
1906	11,889	5	42.0
1907	12,581	7	55.7
1908	13,273	1	7.5

Average = 44.7.

It will be seen from this table that the average typhoid death rate per 100,000 population for the years 1900 to 1908 is 44.7. At no time except in the year 1908 was the rate below 20, and in the year 1905 it reached the extreme height of 89.9. Of course, the fact that the population of the city is less than 14,000, and that the number of deaths in one year is only on the average about five, detracts somewhat from the value of these figures, since it might easily be that an ignorant or careless physician had diagnosed and reported several cases as typhoid fever when in reality they were something else. However, in this event, it is not probable that the rate would be so consistently high, year after year.

That the typhoid fever death rate in Port Chester is remarkably high is evident when it is remembered that the average typhoid fever death rate in the United States registration area is only 32.2, and that there are only two other countries, namely Spain and Italy, which have a higher death rate than the United States from among all of the following list:

TABLE SHOWING TYPHOID FEVER DEATH RATES PER 100,000 POPULATION IN THE UNITED STATES AND OTHER COUNTRIES

COUNTRY	1902	1903	1904	1905	1906	Averag 1901–5
U. S. Registration, area......	34.4	34.3	31.9	28.1	32.1	32.2
Australasia	20.5	25.5	15.5	13.7	15.7	19.0
Austria	18.1	19.7	19.3	......	......	19.9
Belgium	17.8	15.6	14.9	13.7	......	16.8
Germany	7.0	7.3	7.0	6.3	......	7.6
Italy	34.6	35.5	36.9	32.7	28.1	35.2
Japan	11.4	9.8	10.8	13.2	......	11.6
Spain	45.8	43.4	44.4	37.7	42.2	44.5
Sweden	10.4	5.3	5.1	......	......	8.3
Switzerland	6.0	5.0	7.7	5.0	......	6.2
England and Wales..........	12.6	10.0	9.3	8.9	9.2	11.2

It should be rather appalling to the citizens of Port Chester to consider that their average typhoid fever death rate, 44.7, is even higher than that of the highest of this list, namely, Spain with 44.5. The average typhoid death rate in Switzerland is only 6.2, or less than one-seventh that of Port Chester. It may also be pointed out that while there are in New York State a few cities whose typhoid fever death rates are as high or even higher than in Port Chester, the average typhoid fever death rate in cities is much less and is steadily being reduced as more intelligent supervision of health conditions is maintained. It is quite possible for cities to reduce their typhoid death rates considerably, and many examples might be cited of cities which have deliberately and determinately reduced their typhoid death rate from 50 or more per 100,000 to 20 or less.

It is, therefore, proper to conclude that the city of Port Chester has a typhoid fever death rate which has been unnecessarily high and which demands immediate action on the part of the officials.

The hygienic condition of a region may also be studied in the light of the number of deaths of children under five years of age. The table following shows the number of these deaths from 1900 to 1908, inclusive:

TABLE SHOWING DEATH RATES PER 10,000 POPULATION OF CHILDREN UNDER FIVE YEARS

Year	Population	Deaths	Rate for 10,000
1900	7,740	58	74.9
1901	8,432	76	90.1
1902	9,123	64	70.1
1903	9,815	52	53.0
1904	10,506	58	55.2
1905	11,198	62	55.4
1906	11,889	77	64.8
1907	12,581	88	70.0
1908	13,273	62	46.7

Average = 64.5.

As shown by this table, the average number of deaths of children under five per 10,000 population for the period 1900 to 1908 is 64.5. The average number of deaths of children under five per 10,000 for Corning is 33.2 for the same period, or nearly half that of Port Chester. Then, again, by United States Census Office statistics the normal rate for registration cities in the United States is 49.6, while if the rural part of the registration States is considered the rate is 34.3. The above figures make it evident that the death rate under five for Port Chester is above the normal and imply that either the water supply, or the milk supply, or both, are contaminated since it is the children under five who are the first to feel the effects of polluted water or milk. They are particularly susceptible to intestinal disorders and any irritating agent in the food or drink supply of the infant has an almost immediate effect upon the intestinal tract.

The number of deaths among children may also be compared with the total number of deaths, and the following table gives the ratios of deaths under five to total deaths:

TABLE GIVING RATIO OF DEATHS UNDER FIVE TO TOTAL DEATHS FOR THE PERIOD 1900–1908 INCLUSIVE

Year	Under Five	Total	Ratio
1900.	58	147	39.5
1901.	76	162	46.9
1902.	64	163	39.3
1903.	52	147	35.4
1904.	58	165	35.2
1905.	62	166	37.4
1906.	77	180	42.8
1907.	88	204	43.2
1908.	62	173	35.8

Average = 39.5.

Here the average is 39.5 per cent., as against 30 per cent., which may be considered the normal percentage. In Massachusetts for the year 1906 there were 50,431 deaths from all causes and 14,902 deaths under five, which gives a ratio of 33.8 per cent. In New York State this ratio was for the same year 35.4 per cent., and for the registration area of the United States, also for the same year, the ratio was 29.9 per cent. This shows beyond all possibility of doubt that there is something in the environment or conditions at Port Chester which makes the city a particularly unhealthful one for children.

In summing up the conclusions derived from the mortality statistics, the fact that the general death rate, the typhoid fever death rate, the rate of deaths under five and the ratio of deaths under five to total deaths are all too high speaks ill for the sanitary condition of Port Chester. The fact that in each case a high and excessive rate is found shows that either bad housing, improper surroundings, polluted water or milk, unhealthy trades, or some combination of these, exists to such an extent that their effect is seen in these high rates. It therefore remains to see whether the exact cause can be found.

Pavements

There are in Port Chester about three miles of paved street, there being, on a rough estimate, between fifteen and twenty miles of streets in the village. Main street is the only street that is cleaned every day. The remaining streets are cleaned twice a week. The street sweepings are collected, piled up in different parts of the village and then sold, to be carted away for fertilizer.

The main streets, particularly those over which the heavy automobile traffic passes, are kept smooth and clean and the general impression of the writer was that Port Chester was a village where the streets were well cared for. Especially is this true along the Shore road and the front of the better class of residences. In the side streets and in the poorer part of the village the condition of the streets leaves much to be desired.

Garbage

The garbage of the village of Port Chester is collected by contract. It was found by the writer that all ashes, garbage and vegetable refuse is being dumped into the water over the edge of Fox island. Port Chester has one temporary dump on North Main street, and also one on the lower end of Purdy avenue.

The dump which is situated on Fox island is in some ways a disgrace. The organic matter is not covered and the dump is foul and filthy in appearance. A particularly nauseating feature lies in the fact that the children of the tenement-house district which is adjacent to the dump, do not hesitate, and are not forbidden, to wander about in the decaying filth, picking up and eating the rotten fruit they find. It has been previously mentioned that probably the great proportion of foreigners in Port Chester contributes in large measure toward making the general death rate abnormally high and that the death rate among children is abnormally high. It might be well to remark in this connection that an indifferent acquiescence on the part of the inhabitants to such scenes as are enacted at the Fox island dump is the kind of thing that makes such a high death rate possible. The remedy for this particular death-dealing factor is obvious and should be resorted to by the board of health at once. Besides this, a matter which concerns the health of the village itself, the dump is a public nuisance in so far as the smell from it extends, and in so far as floating refuse is washed out into the river.

Milk Supply

The milk distribution in Port Chester is entirely primitive. There is no official jurisdiction over it. Private individuals distribute milk in such manner as they think will make them the most profit and at the same time keep the trade. No record whatever is kept of the milk dealers, and officially no one knows anything about either the number of dealers or the amount and quality of milk supplied. There is no inspection of the dairies from which the milk is distributed. Such a condition of affairs as this affords an easy opening for the prevalence of insanitary conditions, and when it is remembered that the rate of deaths of children under five is abnormally high it suggests that a part, if not the majority, of these deaths may be due to impure milk. Of course, there is no direct proof of this, but circumstantial evidence points strongly that way.

The village of Port Chester ought to lose no time in giving to its board of health, and the board ought to at once assume, the power of inspection over the system of milk distribution in that village. The board of health could then appoint the necessary number of inspectors, who, being provided with proper badges, would then regularly inspect all the dairies supplying milk to the inhabitants. The board of health could issue licenses to those dairies whose milk had passed muster, with the provision that these licenses should become null and void just as soon as any persistent irregularity occurred in the handling of the milk. Coupled with these licenses might be supplied the privilege of placing upon each distributing wagon some such sign as "The quality of this milk approved by the Port Chester Board of Health." Then, since every caterer to human wants fears the publication of improper methods on his part of supplying those wants, it would be well to publish periodically the names of such dairies or dealers whose milk did not come up to the required standard.

Another safeguard against impurities in the milk would be a bacterial examination at regular times of samples taken at random from the wagons as they distributed the milk, using here also the weapon of publication in order to enforce attention and care.

The adoption of either or both of the above systems of i
tion would soon result in a pure milk supply and a

of the milk supply would assuredly do its part toward lowering the general death rate of the village.

Ice

The ice of Port Chester is harvested from several ponds in the vicinity of the village. Dr. Sands, in his report to the Department of Health, of March 1, 1906, wrote the following upon this question:

> In the summer of 1904 the local board of health visited several of the ponds from which ice was harvested near this village and found their condition so incredibly foul that an appeal was made to the State to send an inspector to take action in this matter. He visited the ponds in question and submitted a report condemning the ponds, a copy of which you will doubtless find on file at Albany.
>
> This board thereupon took up the task of preventing the sale of ice gathered from these ponds for domestic uses and printed notices in the local papers calling the attention of the people to the danger of using this ice in water or cooling drinks or for placing on food to preserve it. The ice dealers were permitted to sell the ice to butchers and tradesmen generally where it would be used for refrigerating purposes only and kept from contact with food.
>
> An experience of a year has shown the impracticability of any such half-way measure. The ice *was* used by many for cooling drinks in the various saloons and for domestic purposes. Of this there is abundant proof. Further, the children of the poorer classes ate ice freely from the backs of these wagons in the summer. Some of this ice looked as filthy as if harvested over a manure pit. The ponds received sewage freely, drainage from pig sties, water closets, and so forth.
>
> Realizing the inadequacy of its former edict the local board has given notice that it is its *intention* to prevent the sale of ice from foul ponds for any purpose whatsoever the coming season. It has got to do that or let down the bars entirely.

Upon inquiry, the Hygeia Ice and Coal Company of Port Chester, said that the sale of ice from Purdy farm was prohibited in the villages of Port Chester and Rye in the year 1906, at which time, owing to the orders of the board of health, they "gave it up and refused to handle the ice." They further state that in 1907 the board of health prohibited the sale of ice from this point for domestic purposes and where it would come into contact with food stuffs; and that to cap it all, " this year (1908) the ice from this pond is being sold without restriction, notwithstanding the fact that nothing has been done to remove the source of pollution " or the fact that the orders of the local board of health have not been rescinded.

To satisfy themselves, then, that sewers really did empty into Purdy pond, or into any of its feeders, the Hygeia Company had an inspection made. In the Tingue park section, in the town of Rye, sewers were found leading direct to the pond, and in addition to this they found that the drainage of the Ridge street section was running into the streams feeding the pond.

The question of pure ice for the village is unquestionably one which demands attention on the part of the health authorities of Port Chester. Even if the transmission of typhoid fever by ice is not probable, as is asserted by some scientists, it is certain that organic matter may be frozen in ice and then transferred to drinking water in which it is melted. It seems to the writer, therefore, that any measures to improve the sanitary condition of the village should include the suppression of the sale of ice from polluted waters.

*Sewerage**

The original sewers of Port Chester, according to the report of the Port Chester engineer, Mr. Fred S. Odell, dated November 21, 1902, were constructed before the law requiring the approval of the State Board of Health had been passed. At this time (1902), the sewage was discharged through outlet sewers in Westchester avenue and Highland street directly into the Byram river. These outlet sewers discharged in the midst of the manufacturing and business part of the village, and even at this time complaints had been made of the offensive odors caused thereby. Mr. Odell considered it essential, therefore, to convey the sewage to a new outlet about half a mile below the then existing outlets to a locality especially favorable for purification works, and from which the effluent may discharge into the harbor in a much larger body of water. The outlet was to be reached by a tunnel through the high ground between Purdy avenue and Fox

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* For map showing sewer system see page 724 of 27th Annual Report.

Island road. A new main sewer was to be constructed through Main street, Westchester and Travis avenues to Purdy avenue, thence across private property to the proposed location of the purification works. The plan proposed by Mr. Odell involved a separate system for collecting and conducting house sewage only. He maintained that it was not necessary to allow the storm water to runoff into the sewers as the natural channels were sufficiently frequent to carry off all the storm water themselves.

On September 17, 1907, in a report to the State Commissioner of Health the writer made a report regarding a complaint of the village of Rye in the matter of the discharge of sewage from the northwestern portion of Port Chester into Blind brook. After investigation, the writer concluded that while the complaint was justified by the facts, yet, since a number of private sewers in the village of Rye itself were found to be discharging into Blind brook, " any attempts by residents of Rye to prevent the pollution of a brook by Port Chester when they are themselves contaminating the brook, is ill-timed." The writer found that a considerable contamination came from the Italian settlement in Port Chester, but that another large part came from that part of that settlement in the town of Rye. It was recommended in this report that the authorities in Port Chester be encouraged " to take such steps as will either annex that portion of Washington park in the town of Rye to the village of Port Chester, or will secure legislative permission to form a sewer district of the same territory, in both cases for the purpose of the construction of a sewerage system and a sewage disposal plant discharging into Blind brook," thus taking care of this district not directly tributary to the Byram river.

On March 1, 1906, Dr. B. J. Sands, health officer of Port Chester reported that the sewage system was at that time inadequate in that it covered a part of the village only. He noted that there were three discharging outlets into the Byram river near the area of densest population, which was therefore insanitary "and against the general state laws." An extract from his report follows:

Permission for these outlets was granted by the State Board of Health some years ago and you will doubtless find this on record. This was intended, however, to be a temporary arrangement and in my judgment should not be continued much longer. The river at most seasons carries only a small body of fresh water but is swept by the tide for a considerable distance further upstream than the sewer outlets. At low tide certain mud flats are left bare and by reason of their pollution by sewage, exhale a stench in the neighborhood. Furthermore, this unpurified sewage is carried out into the sound, on the neighboring shores of which are private estates and public bathing beaches, which the sewage contaminates.

Continuing further Dr. Sands advised the completion of the sewer system at the earliest possible moment and the purification of the sewage before being discharged into Long Island sound. He also strongly urged joint action on the part of the village of Rye.

Attached herewith is a map of the village of Port Chester, showing the following:

Sewers constructed 1887–8.
Sewers constructed 1889–90.
Sewers constructed 1899.
Sewers constructed 1904–5.
Proposed new main sewer.
Proposed district trunk sewer.

This map shows plainly that from time to time, whenever it was absolutely necessary, Port Chester has added to its sewer system. The fact remains, however, that the additions have always been running behind the demand created by the growth of the village, and that there is a considerable portion not connected to the sewer system and draining either into Blind brook or into the small stream and ice ponds already referred to.

From the foregoing studies it is evident that the sewerage conditions of Port Chester imply the same lethargic indifference which the majority of the inhabitants display toward other matters of sanitation. It is not possible that the sewage from nearly 14,000 people can be discharged so closely to the most thickly populated part of the town, or that a considerable portion of the village can be left longer without sewers, without working harm, and it is certainly time for the more intelligent members of the community to bring about such a sentiment as will result in bringing their sewerage system up to modern standards and requirements.

Water Supply

Port Chester has no water supply of its own. Since 1884 the waterworks at Greenwich, Conn., built by the Greenwich Water Company in 1880, have been extended to connect with the distribution system at Port Chester; from which in turn Rye and Harrison, N. Y., are also supplied. The supply at Greenwich comes from Putnam and Rockwood lakes by gravity. All the water at Greenwich is filtered through mechanical pressure filters. The old and smaller filters are Hyatt filters, and the new filters are of the horizontal pressure type. The capacity of Rockwood lake is 325,000,000 gallons and of Putnam lake 300,000,000. The supply main in 1889 was 12 inches in diameter for three miles, then two 10-inch pipes, three miles to Port Chester, the other one mile to Greenwich.

The following are the average of water analyses for the twelve months of the year 1901 of the Greenwich water in parts per million:

Color	.28
Total solids	49.8
Loss on ignition	17.3
Mineral residue	32.5
Chlorine	2.73
Free ammonia, not filtered	.017
Albuminoid ammonia	.193
Nitrites	.002
Nitrates	.08

From the above analysis it is evident that, except for the slightly high quantity of albuminoid ammonia there is no indication of impurities in the water. The chlorine, the nitrites and the nitrates are all consistently low. In his report of March 1, 1906, Dr. Sands has written as follows:

> At various seasons in the year, however, it (the water) is muddy and emits a foul odor, and certainly is not fit to drink

for the pleasure of drinking. Now the question is, how much dirt and how much stench, even if there are no bacilli present, have we got to stand before we can officially condemn the water?

We have had no analyses made but on investigating reports made to the Greenwich Board of Health, that village deriving its water from the same source as our own, we found that the water was clear of bacterial pollution.

During a portion of the summer of 1902 the taste and odor of the water at Greenwich was not agreeable. This was at the time when the water was low in the reservoir. Upon careful analysis by the State Chemist, however, it was pronounced free from disease producing elements.

In 1903 there were thirty cases of typhoid in the town of Greenwich. The water from a number of the wells was examined by the chemists and several of them were condemned. At that time the public water was again examined by the State Chemist and again pronounced not dangerous.

In 1904 there were twenty cases of typhoid fever in Greenwich, in 1905, two, and in 1903, three.

There has never been an examination of the public water supply in which it was not concluded to be a good one, although at times unpleasant to drink. Therefore it can safely be said that the high death rate at Port Chester is not due to the quality of the water supply. At times when the lakes are low, of course, the water is not as clear as it ought to be, but without the presence of bacilli or unhealthful elements this would hardly be a cause for official condemnation. The beauty of the watershed and the absence of any contaminating agents give the impression that a healthful water supply ought to be obtained therefrom.

Summary

1. The village of Port Chester was originally known as Saw-pit, and was settled in the first part of the Seventeenth century, not having much growth until the Revolution. From that time until this it has grown steadily and has now a population of over 18,000 inhabitants.

2. Port Chester is situated on the west side of the Byram
and is one of the stations along the line of the N. Y. & H.

3. The village is a place of more than average import in manufacturing, the value of its products for 1900 b $3,840,732. The number of women and children employe above the average.

4. The proportion of foreign born to native born populatio Port Chester is 39.6 per cent. This is a large proportion indicates a predisposition toward unhealthful manners of li There is no general tenement house congestion in Port Ch and the number of families per dwelling is only 1.11.

5. The general death rate has been excessive for the past years, the average being 17.0.

6. The typhoid fever death rate is remarkably high, avera 44.7 for the series of years 1900–1908. The maximum rate reached in 1905 when it was 89.9.

7. The death rate of children under five is also high, avera 64.5 for the same period as the general and typhoid rates a given. The fact that children are particularly susceptible to influence of impure milk or water suggests that either or bot these may be contaminated.

8. The ratio of deaths under five to total deaths is 39.5 per c This is higher than what may be considered the normal perc age by 9.5 per cent and is merely another indication that t is something in the conditions existing at Port Chester w makes it an unhealthful locality for children.

9. The amount of paved streets in Port Chester is about t miles. The streets of the village seem to be kept in a c condition.

10. The garbage is collected by contract. There are th dumps, one on North Main street, one at the lower end of Pu avenue, and one on Fox Island. This last dump is in an unsa factory condition, and the fact that the children of the adjac tenement-house district pick up and eat the rotten fruit they f may have something to do with the high death rate amo foreign children.

11. There is no jurisdiction over the milk supply, and si the death rate among children is high it is fair to assume t the milk is not clean and may have much to do with the pres high typhoid rates.

12. The natural ice supply of Port Chester is undoubtedly polluted, since it has been found that sewers and drains have their outlet in one of the ponds where ice has been cut and used. The local board of health has prohibited the use of this pond, which prohibition is apparently disregarding.

13. The present sewerage system of Port Chester is inadequate. The plans proposed by Engineer Odell in 1902, which provided for a tunnel under the ridge which approximately follows Regent street and for a sewage disposal and purification plant just south of Fox island, have never been carried out. There is a large part of the city, which on account of this ridge cannot be properly sewered until the proposed tunnel is constructed, or some other plan of sewerage adopted and put into execution.

14. Port Chester secures its drinking water from Greenwich, Connecticut. The water supply at Greenwich is apparently free from contamination, although at times, when the reservoirs are low the water is muddy and emits an odor. Even at these times, however, there is no indication, by chemical analyses, or disease producing agencies.

Conclusions

Since the possibility of a polluted water supply being the cause of the high death rates in Port Chester is eliminated, and inasmuch as the poor sewerage system, inadequate pavements, and primitive system of garbage disposal would not account for the excessive death rate, the writer is forced to conclude that the main disturbing element is to be found in the milk supply, the ice supply, or both.

The fact that there is absolutely no jurisdiction over the milk supply and distribution, and the fact that there is a high death rate among children would suggest that the milk is polluted. I would recommend, therefore, that the village of Port Chester be advised by the Department to institute as early as possible some system of milk inspection.

In the matter of ice supply the local board of health has already prohibited the use of the polluted ponds for ice cutting, and the first step in its improvement, therefore, would be to enforce the orders of the local board of health, after which it is within the province of the local board to endeavor to stop the pollution of the ponds.

The writer believes that the adoption of a system of milk inspection, and the enforcement of the present rules of the local board of health would soon result in a much lower set of death rates for the village of Port Chester.

Respectfully submitted,

H. N. OGDEN,
Special Assistant Engineer

PORT JERVIS

History

The vicinity of Port Jervis was first settled by French refugees in the last part of the seventeenth century, the fertile river valleys in the vicinity of the junction of the Neversink and the Delaware rivers proving the attraction for the early settlement. Some of the settlers in this region, at that time a remote and secluded locality, came across from the Hudson river, while others, without doubt, came up the Delaware river from New Jersey. The Delaware Indians, who had their villages in the vicinity, permitted the newcomers to settle and occupy parts of the land without molestation, and for many years the two peoples lived side by side in peace.

Grist mills and saw mills are known to have been built and used in the vicinity of Port Jervis as early as 1750. From 1700 to 1767 much trouble and strife were experienced in the matter of the location of the boundary line between New York and New Jersey, and there is a continuous record in the colonial history of hard personal struggles to get possession of and hold the rich farming lands in the vicinity of Port Jervis. The New Jersey contestants made the line run from the Hudson river at latitude 40 to the Delaware at Cohocton, making the lower end of the Neversink river a part of New Jersey, while the New York contestants made the line start from the same point and end at the Delaware river just below Port Jervis. The struggle was finally decided in favor of New York, making the settlement a part of that State, so that the troubles from this cause, lasting sixty-seven years, were finally adjusted.

In 1755, there arose the French and Indian war, so called, which was really a war between England and France with the Indians on the frontier taking sides with the French. This necessitated the removal of the pioneer settlement, and about eighteen families living on the lower part of the Neversink were concerned in the change. After the war was over settlements were again made, but the Indian hostilities at the time of the Revolutionary war again drove the settlers to the forts from which they could see the flames from their houses, barns and crops rise to the sky. Captain Brandt, the famous Indian half-breed, attacked the settlements in 1778 and again in 1779. At the close of the war farmhouses were again built, though the construction of the Delaware and Hudson canal really marked the beginning of the present city. This canal, built in 1826 through the activity of Maurice Wurtts, who may thus be said to be the founder of the city, ran from the Delaware river at Port Jervis to the Hudson river at Kingston. The terminus was the natural site for a village which was named after the engineer of the canal, John B. Jervis, whose genius has led to his enrollment among the early engineers of this country. In 1846 Port Jervis had five stores, three taverns, one grist mill, three churches and one school. At that time, lumber, brought down the upper Delaware, was an important industry, and some of the Pennsylvania coal was distributed from here. It is of passing interest to note that the canal, though only fifty-nine miles long, and small as canals go, being thirty feet wide on top and four feet deep, was the beginning of that series of vast properties since developed by the Delaware and Hudson Canal Company, and that it was in successful operation until discontinued in 1899.

The city of to-day, incorporated in 1907, and developed from that canal terminal village, contains about 10,000 people, covers an area of about one square mile and is essentially a railroad town, the Erie railroad making it one of its division terminals. It is also the junction of the main line with the branch line running to Newburgh, and it is one terminus of the Port Jervis, Monticello and New York railroad a branch line of the New York, Ontario & Western railroad.

Topography

The city is built on a flat triangle of land formed by the junction of the Neversink and Delaware rivers, the triangle having a depth of about a mile north and south and a base of about the same length east and west. The elevation of the river at low water is 410 feet above tide and the banks are not far from 20 feet high. Near the river and along the railroad tracks where the business section is, and through the southeastern parts, the land remains level at about the elevation of 430. Northwest from the center of the city, the land rises with a marked incline of about 8 per cent. to Main street, reaching an elevation of about 470. Beyond Main street the land is flat again until the hills which bound the city on the north are reached and it descends on the east to the Neversink river. The point of the triangle is drawn out into a long peninsula between the two rivers on which is located the city cemetery and at the very end of which is a rock and a government monument which marks the junction point of the boundary lines of the three states of New York, Pennsylvania and New Jersey. Up the Delaware river nearly a mile, and forming a part of the city is a suburb known as Germantown from the nationality of a large part of its population. Across the Neversink and a mile away in the other direction is another suburb known as Tri-state, or Carpenter's point. Across the Delaware, and connected with Port Jervis by a bridge is the Pennsylvania village of Matamoras, which does a large amount of its business with Port Jervis. The hills to the north rise very abruptly from the valley, Mount Peter, on the northwest reaching an elevation of 1,000 feet within the city limits.

There are two small brooks which flow down the valley, one on each side of Mount Peter, emptying into the old canal bed, although their volume is usually entirely absorbed by the water works reservoirs through which they pass on their way down. A third brook finds its way from a valley further east into the Neversink. The river in times of flood rises to considerable heights and the Pennsylvania side has been protected by a dyke. The Port Jervis side has also been dyked along the city front but at times of highwater the lower end of the peninsula and

PORT JERVIS

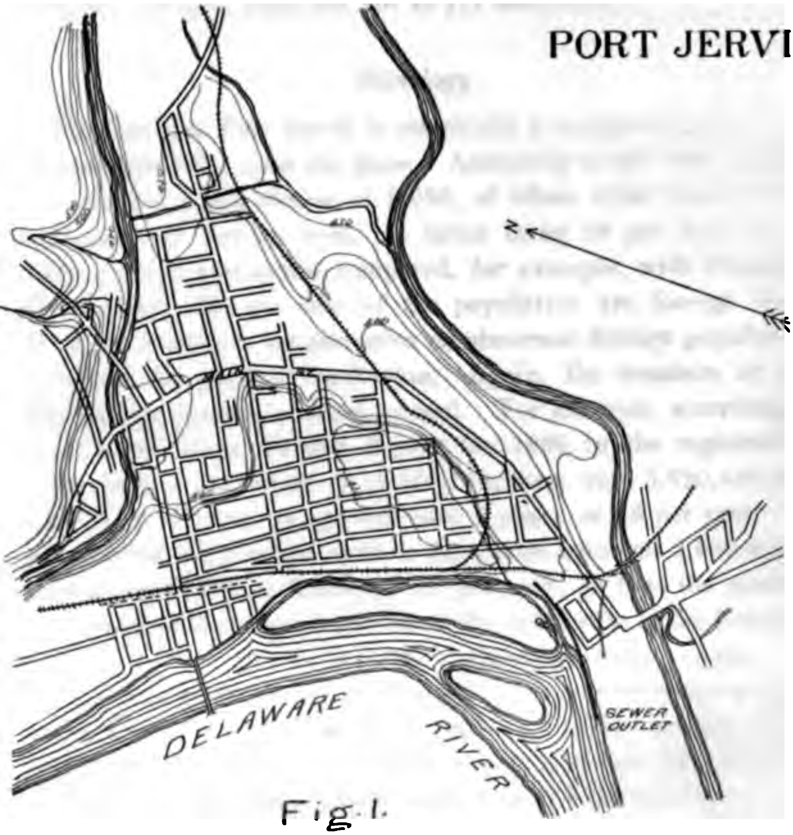


Fig. 1.

particularly the cemetery is flooded. Just at the southeast end of the village the direction of the Delaware river changes abruptly from east and west to north and south and an island in the river at this point, in size about 600 feet by 300 feet, offers a considerable resistance to the flow, particularly when ice is running in the spring. It has been the hope of citizens of Port Jervis for many years that this island might be dredged out by the aid of the National or State Governments in order to lessen the dangers of floods, but this hope has not as yet materialized.

Sociology

The fact that Port Jervis is essentially a railroad town stamps its characteristics upon the place. According to the 1900 census, the city had a population of 9,385, of whom 8,940 were native born and 895 foreign born, the latter being 10 per cent of the total, a small proportion compared, for example, with Dunkirk, where nearly 50 per cent of the population are foreign born. There is, therefore, no excessive or abnormal foreign population to affect the general death rate. Again, the numbers at the various age periods is about normal. For example, according to the United States Census Report for 1906 in the registration states, with a population of 19,960,742, there were 5,620,430 persons under 20 years of age and over 5 years, or 28. per cent. In Port Jervis, the number between these same ages was 2,900 out of a total population of 9,385, or 29 per cent., so that the number of persons at that age of life when the death rate is the lowest is as large in Port Jervis as in the registration states. Again, the density of population is not excessive. For example, the number of dwellings in Port Jervis in 1900 was 1,993, housing 9,385 persons, or 4.7 persons per house, a very moderate concentration compared with Cohoes where there were 8.1 persons per house. Again, there were 2,301 families to 1,993 dwellings, or 1.15 families per dwelling, instead of 1.7 families per dwelling as at Cohoes. There is, therefore, but little tenement house congestion and the impression of the writer, obtained during his inspection of the city, was one of separate homes, each with its own house and yard.

The population is largely of the laboring class. There are normally 2,500 voters in the city and it is estimated that 1,500 of them work in the shops of Port Jervis. Of these about 1,000 work in the Erie shops and the rest in the glass works, in the silver plating works, in the glove factories and in the other similar establishments. The remaining 1,000 men make up the trainmen, the mercantile class, the professional class and the gentlemen of leisure.

The population of Port Jervis is slowly increasing. In 1860 the population was 7,753, in 1890, 9,385, and in 1905 it was 9,695. There is, therefore, a steady upward growth, although the rate seems to be decreasing somewhat. The character of the houses being built, as noted by the writer, indicates, however, that the growth is healthy and of the most advantageous sort, that is, of those citizens who are able to own their own homes and are, therefore, continuously interested in the welfare of the city.

Mortality Statistics

The general death rate of Port Jervis is apparently a little above the average when compared with cities of the same size in the United States. There are about 63 cities in this country whose population is between 10,000 and 15,000 and the writer has computed the death rate for these 63 cities for the years 1900 to 1905 with an average result of 16.2. The average death rate of Port Jervis for the eight years 1900–1908, inclusive, as shown by the following table, is 18.00, or nearly two deaths per 1,000 more than the average for other cities of approximately the same size. This excess is a mark of insanitary conditions not to be accounted for by excessive density of population nor by any large tenement house congestion. It should be noted, however, that there is a tendency towards improvement, since the rate has been steadily decreasing during the past five years, due presumably to the efforts of the local board of health. In 1904, the rate was 20.03; in 1905, 18.05; in 1906, 18.04; in 1907, 17.93; and in 1908, 17.00, a decrease which should be a cause for congratulation to the city.

TABLE SHOWING THE GENERAL DEATH RATE IN PORT JERVIS 1900 TO 1908, INCLUSIVE

Year	Population	Deaths	Rate
1900. . . .	9,365	163	17.37
1901. . . .	9,447	164	17.36
1902. . . .	9,509	176	18.51
1903. . . .	9,571	165	17.24
1904. . . .	9,633	193	20.03
1905. . . .	9,695	179	18.45
1906. . . .	9,757	176	18.04
1907. . . .	9,819	176	17.93
1908. . . .	9,881	168	17.00

Average rate for nine years = 18.00.

The typhoid fever death rate is also, unfortunately unnecessarily high, and the following table shows per 100,000 persons living, the rate for the years 1900–1908 inclusive.

TABLE SHOWING THE TYPHOID FEVER DEATH RATE IN PORT JERVIS 1900–1908 INCLUSIVE

Year	Population	Deaths	Rate
1900. . . .	9,385	3	32.0
1901. . . .	9,447	3	31.8
1902. . . .	9,509	5	52.6
1903. . . .	9,571	7	73.1
1904. . . .	9,633	7	72.6
1905. . . .	9,695	7	72.1
1906. . . .	9,757	3	30.7
1907. . . .	9,819	5	50.9
1908. . . .	9,881	......	......

Average rate for the nine years 1900–1908 = 46.2.
Average rate for the eight years 1900–1907 = 52.0.

The average typhoid fever death rate in New York State for the seven years 1900–1907 was 23.9, although the rate is steadily decreasing as shown by the following table.

TABLE SHOWING TYPHOID FEVER DEATH RATES IN NEW YORK STATE 1900–1907

1900	1901	1902	1903	1904	1905	1906	1[illegible]
27.6	25.0	23.4	22.5	21.6	19.9	19.3	[illegible]

The death rate from typhoid fever in all cities
is abnormally high, but particularly so in the

following table shows for the registration area of the United States and for other countries of the world a comparison of the typhoid fever death rates per 100,000 persons living, for the year 1900.

TABLE SHOWING TYPHOID FEVER DEATH RATES PER 100,000 LIVING IN DIFFERENT COUNTRIES FOR 1900

Switzerland	7.0
Germany	11.0
Sweden	14.0
Scotland	15.0
Ireland	17.0
England	17.3
Belgium	25.0
Hungary	32.0
United States	35.9
Italy	47.0

This table shows plainly that in this country the necessary precautions against this epidemic disease are not taken, and that in consequence this country suffers unduly and unnecessarily. If in the United States the rate could be lowered, even to the rate in England, there would be saved each year 18.6 deaths for each 100,000 population or for the total population of the United States (76,303,387), 14,192 persons who are now sacrificed to the ignorance and carelessness of the municipal authorities. The death rate from typhoid fever in the whole United States is, therefore, not a fair basis for comparison, since it is in itself unduly high; nor is the average death rate from typhoid fever in the sixty-three cities of the country registration area of the same size as Port Jervis, a better basis, since its value for these cities for the five years, 1900–1905, is 40.2, higher even than the general average for the whole United States. This average is, however, affected by an excessive rate in a number of these cities. For example, the following cities of the sixty-three, viz.: Fresno, Cal., Leadville, Col. and Steelton, Pa., have rates of more than 100 per 100,000, rates which mean continuous epidemics, and which raise unduly the general average. That such rates are entirely unnecessary may be seen from a study of the rates in some cities where former high rates have been much reduced by the construction of filter plants for the improvement of the water supplies. For example, in the five years 1890–1895, Albany, using unfiltered water from the Hudson river had an average typhoid fever death rate of 82.3, whereas in the years 1900–1905, using filtered waters from the same source, the rate was 23.6. Binghamton in the three years 1900–1902, using unfiltered water from the Susquehanna river, had a rate of 46.4, but in 1905–1907, after the installation of filters, had a rate of 13.8. Watertown, for the four years 1900–1904 had an average rate of 100.8, while in 1905, after the construction of their filters, the rate dropped to 23.7.

A city, therefore, with a typhoid fever death rate of 20 or above may be justly said to have an excessive rate and should take steps to determine the cause, and to provide a remedy.

The table already given shows the average rate for Port Jervis for the eight years 1900–1907 to be 52.0 or 16.1 higher than for the whole United States, 11.8 higher than the average of the sixty-three cities of the same size in the United States, and about 30 higher than a fair and reasonable rate. It will be, therefore, of great interest to ascertain, if possible the cause of this high mortality.

Another method of checking the hygienic conditions of a city is by finding the death rate of children under five years of age, since children are particularly susceptible to impure food and milk. In the registration area, in 1900, the deaths of children under five per 10,000 population were 49.9, while in Port Jervis for the period 1900–1908 the deaths and the death rate are as shown in the following table.

Table Showing Death Rate Among Children in Port Jervis 1900–1908

Year	Population	Deaths	Rate
1900	9,385	34	36.2
1901	9,447	18	19.0
1902	9,507	34	35.9
1903	9,571	28	29.3
1904	9,633	42	43.6
1905	9,695	50	51.5
1906	9,757	37	37.9
1907	9,818	32	32.6
1908	9,879	43	43.5

Average death rate for children under five 36.5.

This shows a satisfactory condition, the rate being considerabl
below the average for the country. It is of interest to note l
way of comparison that in Massachusetts, in 1906, the last r
port at hand, the rate was 59.7, or 63 per cent. higher than tl
rate of Port Jervis.

Again, the normal ratio of deaths under five to the total deatl
is about 30 per cent. when the number of children in the cor
munity is the normal number as it is in Port Jervis. In tl
registration cities of the United States in 1906 there were 444,2
deaths at all ages and under five there were 132,275 deaths, (
29.9 per cent. In Massachusetts for the same year there were (
all ages, 50,431 deaths, and 14,902 deaths under five, or 33.
per cent. and in New York State for the same year there wei
140,626 deaths of all ages and 39,637 deaths under five, or 35.
per cent.

In Port Jervis these death rates have been as follows:

Year	Total deaths	Under five	Rat
1900	163	34	20.
1901	164	18	10.
1902	176	34	19.
1903	165	28	17.
1904	193	42	21.
1905	179	50	27.
1906	176	37	21.
1907	176	32	18.
1908	168	43	25.

Average rate for nine years = 20.3.

The average is plainly less than the normal, and suggests a num
ber of children less than the normal. But this, in view of th
census figures already quoted, does not seem tenable. It follows
therefore, that by this sign conditions in Port Jervis are favorabl
for the health of the growing community.

The tests that have been applied then show a general deatl
rate about 2 per 1,000 above the average, a typhoid fever rat
30 per 100,000 above the normal and a death rate among childrei
less than the normal. The different factors which may affec
these death rates may now be considered.

Milk Supply

The milk supply of Port Jervis is apparently under the most careful supervision, and the regulations governing its collection and distribution are models; in many ways superior to those in force in many cities of the State, which are twice the size of Port Jervis. In October, 1906, the local board of health enacted milk laws, the main sections of which are as follows: provision for the licensing of dealers, the revocation of licenses, rules for the maintenance of clean stables and barnyards, for the healthfulness of the cows, for the kind of fodder to be used, for the cleanliness of those handling the milk and for the care of the milk. The rules provide that dealers who have applied for licenses to distribute milk, and to whom the board of health has issued licenses, may post upon their wagons the words "Certified by the Board of Health, Port Jervis, N. Y." This, it seems to the writer, is a somewhat dangerous approval of milk, unless the board maintains a milk inspector whose reports show a continuous observance of the excellent code of rules. It is the understanding of the writer that no such continual inspection is practiced and that the "certified milk" is really "licensed milk." It is a very easy matter to keep track of the dairies from which the milk comes since each dealer files with his application a list of the farms from which, and from which alone, he promises and agrees to take milk, except that he promises if, in an emergency, other farms are drawn upon, or milk is bought from other dealers, he will immediately report that fact to the board. In company with the health officer, Dr. F. E. Gessner, the writer visited about a dozen dairies, and found them generally in good condition. The most common defect was the open ceilings of the stables where the milking was done. These ceilings were made of poles about six inches apart on which hay was piled, and between which dust and dirt continually sifted. Some of the stables were markedly deficient in light and air and one was very dirty, with a broken wood floor, a loose pole ceiling and with only one small window. The list of the board includes thirty-one different dairies, and, while the writer does not intend to imply that the dairies or the milk supply are responsible for either the high general death rate or for the typhoid fever death rate, he believes that more rigid inspection should be practiced, and that no milk should be sold in the city unless a license has been granted, and also that the rules of the board should be strictly enforced and conscientiously observed. It would seem desirable to inaugurate a scoring system the results of which could be published twice a year in the city papers in order to improve the condition of some of the stables and to emphasize the good quality of the milk from those stables which have been brought up to a high standard of cleanliness.

Garbage

The garbage collection of Port Jervis is not carried on with the same degree of excellence as some of its municipal institutions. Two or three farmers collect swill under a private arrangement with the householders and carry it off to feed to pigs. The city dump is on a low, flat island in the Delaware river at the foot of King street, and refuse from stores, ashes and the general city refuse is dumped there. Some individuals assume the task of raking this over for the sake of the metals, bottles, etc., which may be of value, and the paper, wood and rubbish are occasionally burned. The dump is flooded at times of high water and whatever will float is washed into the stream and carried away. The condition of the huts on the edge of this dump, occupied by negroes generally, is disgraceful, and this locality forms the most unsightly quarter of the city which the writer found in the course of his investigations. The dump is probably not a source of danger to the city itself, but it constitutes a violation of the provisions of section 75 of article 5 of the Public Health Law and for the sake of the good character of the river below, should be stopped. If the city is not ready to install a garbage cremation plant, the garbage should be buried, at least all of the putrescible part, on land above the high-water mark, and a regular city collection system should be instituted.

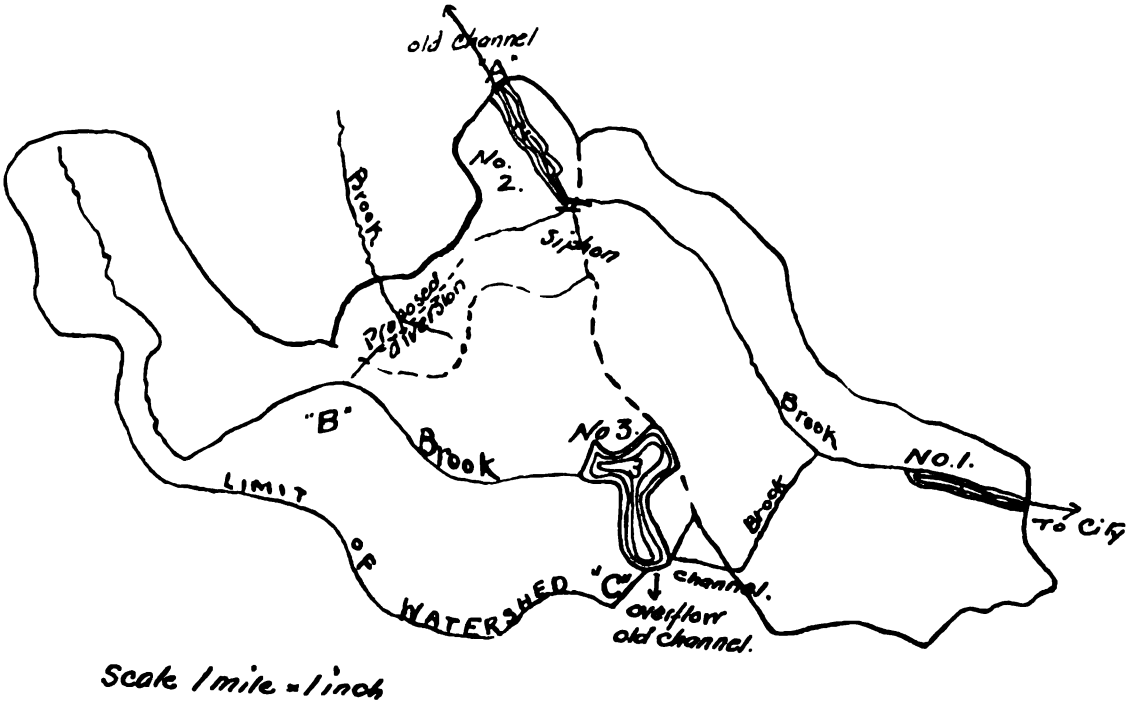
Sewerage

Port Jervis has a sewer system which is well designed, complete and apparently satisfactory. It was designed in 1890 by Mr. H. C. Landon, submitted by the village sewer commissioners to the State Board of Health in February 1891, and built in the summer of 1891. The system is a separate one, all storm water being excluded except that some roof water is admitted from the houses on East Main street adjoining the Neversink river. The surface water is readily cared for in the gutters and by short lengths of pipe and discharges into the two rivers and the brooks. There are five sewerage districts each with its own outlet, though one of these carries by far the largest amount of sewage. One district, known as Germantown, includes the suburb to the north-west of the city proper, and has a 10-inch pipe discharging directly into the Delaware river. A second district, known as the King street district, includes the level area south-west of Main street, most of it too low to discharge into the main sewer. This district has an 8-inch pipe also discharging directly into the Delaware river, at the end of Second street. A third district at the south end of the city including an area of about ten acres on the north side of the Neversink river and a fourth district of about the same size on the south side of the river, both discharge into that river under or near the Main street bridge. The fifth district, known as the Hammond street district, includes the city proper and discharges into the Delaware river at the extreme south end of the city. It was found by experience that floating matter accumulated on the surface of the water held back in the eddy formed at the point of discharge, and in 1899, permission was given by the State Board to extend the outfall 500 feet down stream, into a part of the river where the current was more direct. The 18-inch cast iron pipe now discharges into the stream without any resultant accumulation. High water interfered at times with the operation of the sewer system, causing the sewage to back up in the pipe system and overflow the basement fixtures, and even flood the manholes. To obviate this difficulty, a small pumping plant has been installed on the line of the outfall sewer just before it goes under the Erie railroad embankment, by means of which, through the agency of two one-million gallon pumps, the sewage can be lifted from a well, provided on the line, and forced out as fast as it enters. This device works admirably and maintains a constant flow of sewage, even at times of highest water in the river.

There is no evidence that any defects in the sewer system exist, or that if they do exist, their effect is prejudicial to the health of the city. The distribution seems ample, and the disposal is into a stream of water of sufficient volume and current so that there is no danger of a public local nuisance. But there is a disregard of the rights of riparian owners down stream in discharging raw sewage into a river which later is used for drinking purposes. For fifty miles below Port Jervis the river flows through an unsettled country, with steep wooded slopes reaching to the very edges of the river so that no immediate injury is produced. At the end of this distance, however, are the two municipalities of Belvidere and Easton in Pennsylvania, which take their water supply from the river and are thus liable to the effect of the sewage pollution from Port Jervis. The drainage area of the Delaware at Port Jervis, including the Neversink river, is 3,600 square miles, and the summer flow is not less than 150 cubic feet per second, as a minimum, with the ordinary summer flow three times this amount. The sewage flow is about two cubic feet per second so that the dilution, at the lowest stage of the river is 75 times, and generally many times this amount. The danger, then to be apprehended from the present method of discharge is not great, but since the river water after a flow of from 12 to 16 hours after receiving raw sewage becomes a municipal water supply, there must remain some danger therefrom.

Pavements

The pavements of Port Jervis are yet to be built. Except for a small amount of stone block pavement in the business section there has been no attempt to provide the city with modern types of city pavements. The effect, therefore, is of unlimited stretches of mud in place of streets, the amount depending on the interval since the last rain, and on the amount of gravel or shale which has been hauled onto the street surfaces. There is, therefore, no possibility of keeping the streets clean and one man with a push cart employed in collecting paper and other litter represents the street cleaning department. It would seem that with its admirable public water supply and complete system of sewers



Watershed of Port Jervis Water Supply.

that Port Jervis might now seriously consider the matter of street improvements.

Ice

The ice supply of Port Jervis comes from three sources, viz.: From Reservoir No. 1 of the water works, from Martin's lake and from a pond on Vail's farm. These are all, apparently, exceptionally good sources of supply, and no evidences were apparent of any immediate pollution. In the case of the water-works reservoir, great care is exercised to prevent pollution of the water at the time of ice cutting. The intake pipe is taken out at the top of the dam and the ice field is located at least 100 feet upstream from the dam. The superintendent of the water company insists that all horsedroppings shall be immediately cleaned up, a man being detailed to follow up the horses and brush up the droppings at once. The men are required to use a privy suitably located back from the bank, and no one is allowed to urinate on the ice or on the bank near the ice. The watchman, who has a cottage nearby, is instructed to be on the watch for violators of the rules of the superintendent. It is even required that only such men be employed on the ice as do not use tobacco and hence are not tempted to expectorate on the ice.

Water Supply

The public water supply service of Port Jervis was inaugurated by the Port Jervis Water Company in 1868 by the expenditure of $75,000 and included Reservoir No. 1, so-called, and a few miles of distribution pipe. Since then, two other reservoirs have been added for storage purposes, and the distribution system has been extended until there are to-day about 22 miles of pipe. It is a gravity system, the water flowing from the storage reservoirs into Reservoir No. 1, which is a distribution reservoir, and thence directly into the city mains. The pressures carried in the mains are from 40 to 60 pounds per square inch. The character of the watershed, its freedom from human habitations, and the careful oversight of the reservoirs exercised by the company is plainly so superior to the conditions generally surrounding a water supply from surface water, as to merit commendation.

From an engineering standpoint, the development of this wate supply has been interesting. When the area draining to Reservoir No 1 was found insufficient, a dam was thrown across another brook by means of which a considerable storage, about 200,000,000 gal lons, was obtained from outside the watershed. Unfortunately th watershed area here was small and not sufficient to fill the reservoi except in unusual seasons. To bring the water from this reservoi across the rocky divide into Basin No. 1, a siphon pipe was use instead of the more natural means, viz., a ditch. The reason fo the siphon was plainly to avoid the cost of a long deep ditch i rock, but there has been much difficulty in operating the siphon, and its use renders the lower part of Reservoir No. 2 of no use, since the siphon refuses to work when the lift is more than thirtee feet. The length of the siphon is 1,300 feet, and the fall availabl to work the siphon when the upper reservoir is full is 39 feet. It has been proposed to connect the brook supplying Reservoi No. 3 with the head of Reservoir No. 2 so that any excess of thi brook, after filling No. 3, might discharge into Reservoir No. instead of going to waste. Reservoir No. 3 on another watershe stores 450 million gallons. The stream on which it is located wa closed by a masonry dam and the water ponded back of it, to b carried off artificially in an entirely different direction. Thi original stream is now used for any excess of water which ma escape over the dam in unusually wet seasons. By means of a open ditch the water is led from this reservoir along the ridg between the watersheds of No. 3 and No. 1 and finally over th rocks into the feeder of No. 1.

Water rules for this watershed were applied for in 1897 an were enacted by the State Board of Health on August 19th of tha year, and under those rules a considerable improvement in th quality of the water was effected. Some twenty squatters wh hunted and fished in the vicinity were obliged to move off th watershed; a caretaker was stationed at each reservoir to see tha no fishing or other forms of pollution occurred.

Some trouble has been experienced with one resident, the only one now remaining on the watershed, except the caretakers. Upon complaint of the water company as to the practices of this resident, Mr. O. H. Landreth inspected the watershed and especially the

Port Jervis — Reservoir No. 1.

Port Jervis — Reservoir No. 2.

premises known as the O'Gorman property at the upper end of Reservoir No. 1, and then occupied by Charles Coddington. Mr. Landreth reported, February 22, 1898, that a barnyard, hog-pen and stable were maintained in close proximity to a water course running directly into the water course which supplied the reservoir of the Port Jervis Water Company, and that as then managed the barnyard and hog-pen would actually pollute the water supply. The water company formally offered to stand the expense of making the improvements which seemed desirable, and the attorney for the property expressed his willingness to allow the water company to make the changes needed so that finally this source of pollution was eliminated. At the time of the author's visit the property was not occupied, but anxiety was felt because manure was being hauled from the city into the open fields of the property, the drainage from which might find its way into the reservoir.

In view of the exceptionally favorable conditions on the watershed, the care taken by the water company to maintain the purity of the water, the absence of residents on the watershed, and the wooded area, uncultivated and wild over the greater part of the shed, it is difficult to see how the quality of the water can be held responsible for the typhoid fever excess already pointed out. It is most natural when such an excess exists to ascribe it to a polluted water supply, and generally this will be found in examination to be the case, but the writer is constrained to report that the water supply of Port Jervis seems to be above suspicion and that some other cause for the high death rates must be sought.

There are about 100 private wells in Port Jervis, water for which is found at no great depth below the surface, and it is possible that typhoid is transmitted by means of polluted well water. In the year 1908, just past, there were no deaths from typhoid, showing that the cause of the disease is not a fixed and permanent one; it is also pertinent to note that the deaths by months as shown in the following table do not indicate that there is any preponderance of deaths at any one time of the year, but that the number is scattered through the year in a fairly regular way. If the water was the cause it is probable that the excess of deaths would be found at the same time of the year for each season. Thirteen out of the thirty-six deaths have occurred in May, June and July in the seven years tabulated, and eighteen deaths have occurred from September to February, the time of the year when a minimum number of deaths appear being in the months of February, March and April.

TABLE SHOWING THE DEATHS FROM TYPHOID FEVER IN PORT JERVIS BY MONTHS — 1901-1907

(From Monthly Bulletin)

	1901	1902	1903	1904	1905	1906	1907	Total
Jan.	0	1	0	3	0	0	0	4
Feb.	0	0	0	0	0	0	0	0
March	0	0	1	0	1	0	0	2
April	1	0	0	0	0	0	0	1
May	0	2	0	0	2	0	0	4
June	0	0	3	2	0	0	0	5
July	1	1	1	0	0	1	0	4
August	0	0	0	0	2	0	0	2
September	0	0	1	1	0	2	1	5
October	0	0	0	0	2	0	2	4
November	0	1	0	1	0	0	0	2
December	0	0	1	1	0	0	1	3
	2	5	7	8	7	3	4	36

It was said by local physicians that a large number of cases are imported among the railroad men who make Port Jervis their headquarters, and that the disease is contracted in a majority of cases away from Port Jervis. This theory, which is frequently urged by residents in the attempt to defend the good name of their city, is particularly applicable to Port Jervis where so many citizens are employed by the railroads, and it may be given considerable weight in view of the good character of the water supply.

Summary

1. Port Jervis is essentially a railroad city, depending chiefly for its prosperity on the Erie Railroad shops and on the several railroads which pass through or enter the city.

2. The proportion of foreign residents or of residents of foreign parentage is normal, and the number of children under five years of age is a normal proportion of the total population.

3. The general death rate in Port Jervis is 18.0 per 1,000 for the nine years, 1900 to 1908, inclusive, which is 1.8 higher than in sixty-three other cities of the same size in the United States, and 1.5 higher than the city rate for 1908 in New York State. This is an unsatisfactory condition, implying that there are fif-

Port Jervis — Reservoir No. 3.

teen deaths per year in excess of the normal. An unusual number of deaths in the railroad yards may be responsible for some of this excess, thirteen deaths of this sort being recorded in 1908 and about the same number in other years. Those locally responsible for the health of the community should, however, be continually on guard to reduce this general death rate.

4. The typhoid fever death rate is excessive, averaging 52.0 for the eight years 1900 to 1907, inclusive. The fact that there were no deaths from this disease in 1908 is encouraging. The water supply does not seem to be responsible, and special investigations must be made of the well waters, and of the outside cases to finally determine the cause of the excess. The milk supply must also be under suspicion until a more rigid supervision is exercised.

5. The death rate of children under five is below the normal, both when compared with the total population and with the number of deaths. This is satisfactory and confirms the theory that neither the water supply nor the milk supply is polluted.

6. The milk supply is apparently under proper restrictions, but the actual inspection of the dairies is not sufficiently detailed to assure to the city at all times an absence of contaminated milk. The dealers ought all to be licensed, not merely those who choose to apply for a license, and a more constant inspection ought to be practiced. There is no evidence, however, that the quality of the milk is responsible for the high death rates.

7. The method of garbage collection is defective and unsatisfactory and calls for immediate improvement. There is no probability, however, that the present method of collection and disposal are factors in the high death rates.

8. The sewerage system is on the separate plan, well designed, properly distributed, and caring for the house sewage in an adequate way. The present disposal into the Delaware river, while not producing a local nuisance, is a menace to the purity of the river and the possibility of future treatment of the sewage should be kept in mind.

9. The pavements of Port Jervis are as yet not built so that the appearance of the streets of the city is far from creditable.

10. The ice supply comes from special ice ponds, which are

without visible pollution and from the water works reservoir, and it may be said to be satisfactory.

11. The water supply comes from impounding reservoirs on the hills to the northeast of the city, the watershed area being unpolluted, waste and wooded. It is unusually free from any possibilities of contamination and is carefully cared for and patrolled.

Conclusions

The writer is brought to the conclusion after his personal visit to Port Jervis, and subsequent tabulation of the mortality statistics of the city with a careful study of the same, that Port Jervis is a city unusually favored by all conditions which should make a city healthful, and that the apparently high death rate from all diseases, and from typhoid fever in particular, is occasioned by causes not susceptible of direct definition, but is consequent upon the character of the city and its population, and may be the result of the several factors suggested in the above report.

In order to improve present conditions and to eliminate those municipal practices which may tend to an inferior grade of living, with a possibility of thus reducing the high death rates, the writer recommends:

1. That the quality of all well water be investigated by the local board of health and that those wells whose water is found by analysis to be polluted, be ordered closed.
2. That the dairies supplying milk to the city be periodically inspected by some competent person, and that the dairies be scored so that those dairymen who have brought their dairies to a high state of sanitary cleanliness may be recognized by the public and their product brought into the demand which it deserves.
3. That the practice of dumping organic matter on the island in the river be discontinued, and that it be buried until such time as a garbage crematory may be built.
4. That the construction of pavements be considered so that as rapidly as may be the present unsatisfactory condition of the city streets may be done away with.

Respectfully submitted,

H. N. OGDEN,

Special Assistant Engineer

ILLEGAL CONSTRUCTION OF SEWERS

Violations of the Public Health Law with respect to the discharge of sewage into the waters of the State without a permit, as required by sections 76 and 77 of article V, and the failure of some municipalities to properly submit plans for sewerage and sewage disposal, are matters that have given me considerable concern and careful thought during the past year.

The importance of the evils arising from these violations, the difficulty of satisfactorily investigating and securing evidence proving their existence; the somewhat questionable limit of authority of the State Commissioner of Health in certain cases which have arisen and the consequent desirability or expediency of some revision or modification of the Public Health Law in this regard, have all been pointed out and discussed in my previous reports to you for 1907 and 1908. Until the past year it had been the hope that these omissions to comply with the State laws were largely the result of oversight or indifference on the part of municipal authorities and that by properly calling attention to them they would be promptly corrected. While this opinion proved to be true in many cases and a prompt compliance with the law was effected, there were found to be many cases where not only reluctance, but actual defiance, of these laws was shown.

This matter is one which is considered of paramount issue and there was accordingly prepared and submitted to the Attorney-General a list of the cities of the State which have violated the provisions of the Public Health Law in the above mentioned regard and which have after due notice failed to correct or rectify the same. In referring these cases to the Attorney-General, his opinion was asked as to the specific scope of authority of the State Commissioner of Health under article V, with reference to sewerage and sewage discharge, and as to his powers and duties in enforcing these sections of the law and collecting the penalties stipulated therein.

This matter was not referred to the Attorney-General until lat in the year, and his opinion has not as yet been received. A soon as this opinion has been rendered, however, it is hoped tha the way will be clearly pointed out whereby these cities can b properly and effectively brought into line and the dangerous con ditions of stream pollution which now result from many of thes violations effectively removed.

SANITARY INSPECTION OF SUMMER RESORTS

The investigation of summer resorts was first taken up by the Department in 1906, when in response to general notices a large number of reports on blanks especially prepared were filed with the Department by the proprietors of hotels and other resorts situated in all sections of the State. The information thus obtained revealed insanitary conditions that emphasized at once a pressing need of greater protection to health of the people of the State who yearly seek these resorts for rest and diversion.

Accordingly, during the summer of 1907 inspection of summer resorts named in following lists was carried on along the shores of Long Island from the Nassau-Suffolk county line easterly along the south shore of Great South bay to Patchogue, together with the sand spit known as Great South Beach or popullarly known as Fire Island, as well as in the southern section of the Catskill mountains.

Long Island District — List of Summer Resorts Inspected in 1907

No.	Hotel.	Proprietor.	Address.	County.
1.	Wardle's Hotel	Thomas Wardle	Amityville	Suffolk.
2.	New Point Inn	E. Hathaway	Amityville	Suffolk.
3.	Amityville Inn	B. F. Conklin	Amityville	Suffolk.
4.	Watson House	E. Freund	Babylon	Suffolk.
5.	Le Grange Inn	C. C. Campbell	Babylon	Suffolk.
6.	Bayport House	Henry Stokes	Bayport	Suffolk.
7.	Eureka House†	George T. Carr	Bayport	Suffolk.
8.	Shanley By Sea	T. C. Wright	Bayshore	Suffolk.
9.	Downing House	Edward Downing	Bayshore	Suffolk.
10.	Courtland House	J. E. McGowan	Bayshore	Suffolk.
11.	The Linwood	J. B. Pullis	Bayshore	Suffolk.
12.	South Bay House	J. A. Senger	Blue Point	Suffolk.
13.	Bestwich's Hotel	John Bestwich	Blue Point	Suffolk.
14.	Hallett House	J. R. Snedicor	Blue Point	Suffolk.
15.	Warner House†	J. R. Warner	Blue Point	Suffolk.
16.	Cherry Grove House†	S. A. Perkensen	Cherry Grove, Fire Island	Suffolk.
17.	Somerset House	Theo. Wulf	East Islip	Suffolk.
18.	Hooker's Hotel	W. Hooker	East Islip	Suffolk.
19.	Orowoo	P. Buchasel	Islip	Suffolk.
20.	Girard House	George D. Girard	Point O' Woods	Suffolk.
21.	Ocean House	George D. Girard	Point O' Woods	Suffolk.
22.	Elmore	J. D. Secor	Sayville	Suffolk.
23.	The Inn	F. L. Davies	Sayville	Suffolk.
24.	Hotel Hamlin	F. W. Hanlyn	Sayville	Suffolk.
25.	Delavan Hotel	Mrs. A. D. Foster	Sayville	Suffolk.
26.	South Bay House	C. A. Brown	Sayville	Suffolk.
27.	White House*	E. O. Ryder	Water Island, Patchogue	Suffolk.

* Reinspected in 1908. † Second reinspection made in 1909.

Of the above twenty-seven resorts, five were found to be in insanitary condition as to water supply, plumbing or disposal of wastes and letters were sent addressed to the proprietors requesting that changes be made to improve the sanitary surroundings of the resort.

During 1907, also, the following resorts in the Catskill mountains were inspected:

Catskill Mountains — List of Summer Resorts Inspected in 1907

No.	Hotel.	Proprietor.	Address.	County.
1.	Willow Brook House	E. P. James	Broadheads Bridge	Ulster.
2.	La Ments Hotel	G. W. La Ment	Big Indian	Ulster.
3.	The Shieftain	M. Zersler	Big Indian	Ulster.
4.	Sammath House	M. Sammath	Griffin Corners	Delaware.
5.	Switzerland House	Jacob Wechsler	Griffin Corners	Delaware.
6	Washington Hotel	D. Freedman	Griffin Corners	Delaware.
7.	Hotel New York	Weitzner & Goodman	Griffin Corners	Delaware.
8.	The Maples*	David Townsend	Griffin Corners	Delaware.
9.	The Edgewood	D. B. Kelley	Griffin Corners	Delaware.
10.	Breezy Hill House†	Milbert & Greenbaum	Griffin Corners	Delaware.
11.	Sunset Park Inn	Owen C. Becker	Haines Falls	Greene.
12.	Kenwood	Elmer C. Pelham	Haines Falls	Greene.
13.	Ledge Edge Inn	Ledge Edge Iron Co	Haines Falls	Greene.
14.	Claremont	Scott & Bush	Haines Falls	Greene.
15.	Squirrel Inn*	H. T. Paul	Haines Falls	Greene.
16.	Haines Falls House*	Wm. Tatterew	Haines Falls	Greene.
17.	Fox Hurst*	C. A. Martin	Haines Falls	Greene.
18.	Grand Hotel	Grand Hotel Co., (U. & S. R. R.)	High Mount	Ulster.
19.	Grampian	E. E. Falk	High Mount	Ulster.
20.	Rossman	Mrs. A. Gustig	High Mount	Ulster.
21.	Hollywood Lodge	H. Tannenbaum	High Mount	Ulster.
22.	Breeze Hill House	Louise Werbel	Hunter	Greene.
23.	Central House	E. Abrahamson	Hunter	Greene.
24.	The Arlington	S. D. Rosenberg	Hunter	Greene.
25.	Prospect House	Cohen & Mandiberg	Hunter	Greene.

* Reinspected in 1908. †Second reinspection made in 1909.

26. St. Charles Hotel	Hochberg & Co	Hunter	Greene.
27. West End Hotel*	H. Crossman	Hunter	Greene.
28. Hunter House†	Adolph Guttman	Hunter	Greene.
29. Kaatsberg Park Hotel†	Henry Moser	Hunter	Greene.
30. Stony View Hotel†	Louis Meyers	Hunter	Greene.
31. Waldorf	H. C. Lang	Phoenicia	Ulster.
32. Washington Inn*	M. Spark	Phoenicia	Ulster.
33. Dillon's Hotel	D. Dillon	Pine Hill	Ulster.
34. Cornish House	J. C. Cornish	Pine Hill	Ulster.
35. Rip Van Winkle House	Freitag & Maier	Pine Hill	Ulster.
36. Pine Hill Hotel	Theo. S. Cole	Pine Hill	Ulster.
37. Mountain View House	M. Freedberg	Pine Hill	Ulster.
38. Winterton Hotel	R. P. Winter	Pine Hill	Ulster.
39. Wellington	A. Strauss	Pine Hill	Ulster.
40. Myer's Cottage	H. C. Myers	Pine Hill	Ulster.
41. Bonnie View*	Mrs. E. J. Bertrand	Pine Hill	Ulster.
42. Snedica Cottage*	Ed Blake	Pine Hill	Ulster.
43. The Watson†	M. & P. H. Diamont	Pine Hill	Ulster.
44. The Alpine†	S. Holloubeck	Pine Hill	Ulster.
45. The New Grant	J. P. Grant	Stamford	Delaware.
46. Wexmere	S. E. Churchill	Stamford	Delaware.
47. Simpson Terrace		Stamford	Delaware.
48. Ingleside	E. L. Jones	Stamford	Delaware.
49. Grey Court Inn	S. R. Brown	Stamford	Delaware.
50. Hamilton Hotel	S. R. Brown	Stamford	Delaware.
51. Hamilton Annexes	S. R. Brown	Stamford	Delaware.
52. Churchill Hall	S. R. Brown	Stamford	Delaware.
53. Kendall Place	G. W. Kendall	Stamford	Delaware.
54. Mountain View House	Chas. MacKillip	Stamford	Delaware.
55. The Cornell*	Banks Cornell	Stamford	Delaware.

* Reinspected in 1908. †Second reinspection made in 1909.

CATSKILL MOUNTAIN RESORTS — *Continued.*

No.	Hotel.	Proprietor.	Address.	County.
56.	Mountain Summit House	Mrs. M. Jacobs	Tannersville	Greene.
57.	The American	M. Mariash	Tannersville	Greene.
58.	Grand Central	Swartz & Leinwander	Tannersville	Greene.
59.	Wilden Hall	S. Freedman	Tannersville	Greene.
60.	Cold Spring House*	L. Bieber	Tannersville	Greene.
61.	Fairmount*	S. Jacobsen	Tannersville	Greene.
62.	Mansion House*	Mrs. C. Vining	Tannersville	Greene.
63.	The Blythwood†	Mrs Lena Frank	Tannersville	Greene.

* Reinspected in 1908. †Second reinspection made in 1909.

Of the above resorts inspected, sixty-three in number, insanitary conditions respecting the water supply, plumbing or sewage disposal were found at nineteen of these resorts and letters were addressed to the proprietors at the close of the season requesting that improvements be made.

During the summer of 1908 the investigation was resumed along two lines; first, the reinspection of those Long Island and Catskill resorts inspected during the season of 1907 where conditions were found to be insanitary, in order to determine whether these conditions had been corrected; second, the new inspection of resorts in that portion of the Adirondack region included in the Raquette river and Saranac river watersheds. Of the twenty-four summer resorts on Long Island and in Catskill mountains, whose owners had been asked to improve sanitary conditions found to exist in 1907, it was found that in fourteen cases insanitary conditions had been abated; in eight instances they had been partially abated; and in two cases conditions were found to exist as previously stated. In the Adirondacks the following forty-three resorts were inspected, seventeen being on the Raquette river watershed and twenty-six on that of the Saranac river.

I. Raquette-Tupper-Long Lakes District

No.	Hotel	Location	Proprietor	Postoffice Address
1.	Hiawatha Lodge*	Spectacle Lakes	W. B. Beckman	Coreys, Franklin Co.
2.	Prince Albert Cottage**	Big Tupper Lake	R. N. Page	Moody, Franklin Co.
3.	Waukesha Hotel*	Big Tupper Lake	G. D. Alexander	Moody, Franklin Co.
4.	Sunset Cottage*	Big Tupper Lake	F. S. Camery	Moody, Franklin Co.
5.	Lake View Farm*	Raquette Pond	W. P. Southworth	Tupper Lake, Franklin Co.
6.	Sagamore Hotel	Long Lake	J. H. Reardon	Long Lake, Hamilton Co.
7.	Endion Camp	Long Lake	L. T. Bissell	Long Lake, Hamilton Co.
8.	Deerland Lodge	Long Lake	A. D. Brown	Long Lake, Hamilton Co.
9.	Osprey House	Blue Mountain Lake	C. E. Vanderburgh	Blue Mountain, Hamilton Co.
10.	Blue Mountain House*	Blue Mountain Lake	M. T. Merwin	Blue Mountain, Hamilton Co.
11.	Daly's Hotel**	Utowana Lake	J. J. Daly	Raquette Lake, Hamilton Co.
12.	Hunter's Rest Camp*	Raquette Lake	G. H. Carlin	Raquette Lake, Hamilton Co.
13.	Brightside on Raquette**	Raquette Lake	J. O. A. Bryere	Raquette Lake, Hamilton Co.
14.	Sunset Camp**	Raquette Lake	R. Bennett	Raquette Lake, Hamilton Co.
15.	Antlers Hotel	Raquette Lake	C. H. Bennett	Raquette Lake, Hamilton Co.
16.	Raquette Lake House**	Raquette Lake	P. Moinohan	Raquette Lake, Hamilton Co.
17.	Lake View House**	Blue Mountain Lake	George Straight	Blue Mountain, Hamilton Co.

* Reinspected in 1909.
** Second reinspection to be made in 1910.

II Saranac — St. Regis District

No.	Hotel	Location	Proprietor	Address
1.	Whiteface Inn	Lake Placid	Harrington Mills	Whiteface, Essex Co.
2.	Undercliff	Lake Placid	C. D. Alton	Undercliff, Essex Co.
3.	Forest View	Lake Placid	W. H. Burnett	Lake Placid, Essex Co.
4.	Lake Placid Club	Mirror Lake	Melvil Dewey	Lake Placid, Essex Co.
5.	Ruisseaumont Hotel	Lake Placid	Evan H. Patrick	Lake Placid, Essex Co.
6.	Cascade Lakes Hotel**	Cascade Lakes	H. H. Nye	Cascadeville, Essex Co.
7.	Raybrook House**	Raybrook	E. A. Harder	Raybrook, Essex Co.
8.	Algonquin**	Lower Saranac Lake	John Harding	Saranac Lake, Franklin Co.
9.	Ampersand Cottages	Lower Saranac Lake	Q. C. Wait	Saranac Lake, Franklin Co.
10.	Esperance House**	Lower Saranac Lake	George La Bounty	Saranac Lake, Franklin Co.
11.	Saranac Inn	Upper Saranac Lake	D. W. Riddle	Saranac Inn, Franklin Co.
12.	The Wawbeek*	Upper Saranac Lake	J. Ben Hart	Wawbeek, Franklin Co.
13.	Rustic Lodge**	Upper Saranac Lake	C. H. Wardner	Coreys, Franklin Co.
14.	Saranac Club	Upper Saranac Lake	A. T. Throop	Bartlett's Carry, Franklin Co.
15.	Rice's Hotel	Lake Clear	C. I. Rice	Lake Clear, Franklin Co.
16.	Paul Smith's**	St. Regis Lakes	Paul Smith's Co	Paul Smiths, Franklin Co.
17.	Fletcher's Farm	Near Bloomingdale	J. H. Rogers	Bloomingdale, Franklin Co.
18.	Highland Lodge	Near Bloomingdale	F. G. Tremble	Harriettstown, Franklin Co.
19.	Ridgewood Villa*	Near Bloomingdale	J. J. Fitzgerald	Harriettstown, Franklin Co.
20.	Lake Meacham Hotel	Lake Meacham	G. W. Cushman	Meacham Lake, Franklin Co.
21.	McCollum's Hotel	Rice Pond	C. A. McArthur	McCollums, Franklin Co.
22.	Rainbow Inn**	Rainbow Lake	S. R. Fosburgh	Rainbow Lake, Franklin Co.
23.	Garondah**	Rainbow Lake	F. C. Toof	Rainbow Lake, Franklin Co.
24.	The Brighton**	Rainbow Lake	L. R. Morris	Rainbow Lake, Franklin Co.
25.	Loon Lake Hotel	Loon Lake	Mrs. Chase	Loon Lake, Franklin Co.
26.	Ralph's Hotel**	Upper Chateaugay Lake	Andrew Morrison	Ralph's, Clinton Co.

* Reinspected in 1909.
** Second reinspection to be made in 1910.

As a result of the inspection of the forty-two resorts listed above, letters were sent in May, 1909, to the proprietors of twenty-five of these resorts requesting that insanitary conditions surrounding the water supply or affecting the general sanitary state of the resort be corrected and in many instances calling their attention to the prohibition against the discharge of sewage into streams and lakes, specifying under what conditions as to sedimentation or preliminary treatment such discharge would be permitted.

During the past year in order to systematize the work and to place the investigation on a firm basis as well as to facilitate the work of inspection, the State has been divided arbitrarily into the following thirteen districts outlined on the accompanying map on which the Adirondack park and forest preserve boundaries are also shown:

1. Thousand Islands — St. Lawrence District.
2. Fulton Chain — Big Moose District.
3. Raquette-Tupper-Long Lakes District.
4. Saranac — St. Regis District.
5. Lake Champlain District.
6. Lake George District.
7. Lake Pleasant — Saratoga Springs District.
8. Western District.
9. Central — Finger Lakes District.
10. Otsego lake — Richfield Springs District.
11. Catskill — Albany District.
12. Southern District.
13. Long Island District.

The work has been carried on along the same lines as in 1908 but on a larger scale. Whereas in 1907 and 1908 it was possible only to have inspectors on this work only a portion of the time, during the season of 1909 two inspectors have given their entire time to the work. One of these inspectors made a second reinspection of some ten delinquent resorts in the Catskills and Long Island where insanitary conditions were found to still exist on the reinspection made in 1908, and then proceeded to make new inspections of resorts in the Catskills, the most congested of all the districts; the other reinspected the twenty-four resorts in the Adirondacks where insanitary conditions were found in 1908 and at the same time carried on new inspections in that region. In addition to these two inspectors a third gave a portion of his time to the inspection of resorts in the Central — Finger Lakes District.

As a result of the summer's investigation the work of original inspection has been practically completed in four of the districts listed above, viz.: Nos. 2, 3, 4 and 9. In District No. 11, 191 new inspections have been made giving a total of 254 resorts inspected in this district, and work has been started in District No. 12 where 13 inspections were made.

The posting of notices containing sections of the Public Health Law prohibiting the pollution of the waters of the State, as noted in my last annual report, was also continued within the inspection work of the past season. Effort was made to post these notices in prominent places along Adirondack lakes and streams and in the Catskills. The endeavor to thus inform property owners of the prohibition against stream pollution and to emphasize the policy of the Department of prohibiting as far as possible the further pollution of the waters of the State has met with the approbation of the majority of the summer resort proprietors.

A description of the work carried on in 1909 in the different districts is given below.

REINSPECTION OF SUMMER RESORTS IN THE CATSKILLS AND LONG ISLAND

On reinspection in 1908 it was found that there were some ten hotels the proprietors of which had either not or only partly complied with the notices sent them at the close of the season of 1907. Letters were again sent to the proprietors of these places calling attention to the inspection made in 1907 and to the letter sent them making certain recommendations and setting forth the desirability and necessity of making certain changes, pointing out wherein they had not complied with the recommendations made prior to the reinspection in 1908, and requiring that the necessary improvements be made before May 1, 1909.

The reinspection of these ten resorts during the past season showed that five have complied with the requests of the Department and that at the remaining resorts listed below partial improvements have been made at the first two, while at the others conditions were as previously reported.

Hotels which have partially complied with requests of this Department

Adolph Guttman, Hunter House, Hunter, N. Y. Premises were inspected July 22, 1907, and plumbing was reported antiquated and dirty. On reinspection made July 9, 1908, it was found that a new plumbing system had been installed in the house with the exception of the kitchen, where there were no traps and the appurtenances were crude and insanitary.

On second reinspection on June 16, 1909, it was found that drain pipe of kitchen sink had been trapped, but that the slop sink and dish washing sink were still without traps and that the latter was in a leaky condition.

Henry Moser, Kaatsberg Park Hotel, Hunter, N. Y. Premises were inspected July 22, 1907, and well under house was reported open to suspicion, and kitchen plumbing bad. Place was reinspected July 9, 1908, when it was found that hotel was supplied with village water but well had not been disconnected. Also that kitchen sinks were without traps and that waste water from wash basins on the second floor was discharged into rain water leader and thence on to surface of ground.

A second reinspection was made on June 16, 1909, which showed that well had been disconnected but that otherwise conditions were as previously reported.

Hotels which have not complied with the requests of this Department

Emanuel Hollenbeck, The Alpine, Pine Hill, N. Y. Premises were inspected July 19, 1907, and inspector reported that the spring from which water supply of hotel is taken was liable to pollution from surface wash, and that the plumbing was old and dilapidated. On reinspection made on July 10, 1908, it was found that spring had been protected from surface wash, that hotel was equipped with sanitary flush closets, but that the kitchen plumbing was bad. No traps were provided and the leaky sinks allowed dish water and slops to drip over the floor and over the cellar stairs, the cellar not being shut off from the kitchen. A second reinspection made at the close of the season showed that no steps had been taken to remedy these insanitary conditions.

A third reinspection was made on June 14, 1909, and conditions were found as previously reported.

Milbert & Greenbaum, Breezy Hill House, Griffin Corners, N. Y. Premises were inspected on July 18, 1907, and the well from which the water supply of the hotel is taken, was reported liable to pollution from a stable. On reinspection made on July 11, 1908, stable was found empty and one of the proprietors stated that he would have stable moved at close of the summer season.

A second reinspection was made on June 15, 1909. Stable had not been moved and was being used for both horses and cattle. Proprietor again stated he would remove it at close of season. On June 30, 1909, the proprietors were advised in reply to a letter received from them stating that circumstances would not allow them to move their stable, and that they were taking only a limited supply of water from the well since they have a house supply from springs which can furnish all the water they need, to abandon and fill in their well.

George T. Carr, Eureka House, Bayport, N. Y. Premises were inspected on July 6, 1907, and inspector reported plumbing bad and well from which water supply is taken liable to pollution from privies and cesspool. Proprietor was advised on August 29, 1907, to discard this well and connect with the public water system. Place was reinspected on June 22, 1908, and conditions were found as previously reported.

A second reinspection was made on June 17, 1909, and conditions were found as previously reported. Proprietor, however, stated that he had ordered his hotel connected with the village supply, but intends to keep his wells connected in case of emergency.

REINSPECTION OF SUMMER RESORTS IN THE ADIRONDACKS

During the past season reinspections were made of twenty-fiv of the summer resorts in the Adirondacks, where insanitary con ditions were found in 1908. Of twelve of these resorts in th Raquette-Tupper-Long Lakes district, six were found to hav complied with the requests of the Department, at two, improve ments were under way, while at four, conditions were as previousl reported. Of thirteen resorts in the Saranac–St. Regis district three have abated insanitary conditions found in 1908, two hav made partial improvements, while at eight, no improvements hav been made. It may be worthy of note, however, that the pro prietors of Adirondack summer resorts have expressed their ap probation of this phase of the work of the Department and i practically all of the above cases where conditions were found du ing the past summer as reported in 1908, the proprietors ha plans for improvements under consideration and intend to compl with the requests of the Department.

The following resorts, memoranda in regard to which are give below, have not complied or have only partially complied with th requests of the Department and will again be reinspected in 1910

I. RAQUETTE-TUPPER-LONG LAKES DISTRICT

Moody, Franklin County

R. M. Page, The Prince Albert, Moody, N. Y. These premise were inspected on June 9, 1908, and the inspector found tha sewage from this resort was discharged directly into Big Tuppe lake, and feces lying on the shore under a cover of boards whic had been placed over the mouth of the sewer. On May 25, 1909, the attention of the proprietor was called to this insanitary condition, and he was advised that this discharge of sewage int Big Tupper lake is a direct violation of section 76 of the Consolidated Public Health Laws and requested to provide some suitable means of sewage disposal involving sedimentation.

A re-inspection of this resort was made on August 6, 1909, when it was found that conditions remained as previously reported. The proprietor, however, stated his intention of constructing some form of sewage disposal plant in the fall of the year. Mr. Page leases the house and he wished to consult with the owner in regard to the proposed improvements.

Raquette Lake, Hamilton County

J. J. Daly, Daly's hotel, Raquette lake, N. Y. This resort was inspected on June 16, 1908, and the inspector found that the privy used by the help was a menace to the health of the guests and also that there was an opening along the top of the cesspool through which an overflow of sewage to Utowanna lake might take place. The privy was reported to be open at the back, feces on the surface of the ground and foul in general. On May 21, 1909, these insanitary conditions were called to the attention of the proprietor and he was advised that inasmuch as he had sanitary flush closets in his hotel to abandon this privy and requested to do so before the opening of the 1909 season.

This resort was reinspected on July 31, 1909. The inspector found that the proprietor had complied with the requests of this Department as regards privies, but that he had not yet installed any sewage disposal works. It seemed to the inspector that a subsurface irrigation system would be the most feasible means of sewage disposal since the soil is sandy and since there is sufficient space for such improvement. The proprietor stated his intention of having such improvement made at the close of the season.

J. O. A. Bryere, Brightside-on-Raquette, Raquette lake, N. Y. This resort was inspected on June 16, 1908, and the inspector found that the lake intake which is the chief source of water supply for the hotel was only about 100 feet from a dock where boats are kept and bathing occurs. On May 21, 1909, a letter was addressed to the proprietor calling attention to the danger from contamination of the water supply and he was advised to remove the intake several hundred feet further away from the dock.

This resort was reinspected on July 30, 1909, and it was found that while the proprietor had not complied with the requests of the Department, he was contemplating securing a new source of water supply from a spring located about half a mile southwest of the hotel.

R. Bennett, Sunset Camp, Raquette lake, N. Y. This resort was inspected on June 16, 1908, and the inspector found that the water used for all purposes at the resort except for table use was pumped from Raquette lake. The intake was reported located within 250 feet of the bathing beach and extended only fifty feet into the lake, the natural flow in the lake being from the bathing beach to the intake. Furthermore, it is reported that there was danger from the pollution of the lake about 1,500 feet above the intake by sewage from some cottages, and that the water supply obtained through this intake is obtained largely from the Marion river which is subject to more or less pollution from steamboats and resorts along the shores of Utowanna and Blue Mountain lakes.

On May 21, 1909, the attention of the proprietor was called to the insanitary conditions associated with the source of water supply and to the feasibility of obtaining all the supply from the spring from which he was obtaining his table water supply and which spring appeared to have a sufficient yield to supply all the water for the resort.

This camp was reinspected on July 30, 1909, when it was found that the hotel was partially supplied from the spring above referred to through a ¾-inch pipe. The flow through this pipe was about 2,000 gallons per day, while 4,000 gallons per day were required. Consequently water was also pumped from the lake to supply the needs of the hotel for washing purposes. The inspector found that a larger supply can be obtained from the spring probably sufficiently large to supply all the needs of the hotel and the proprietor stated that in the fall he intended to increase the size of the pipe. The inspector also found that the kitchen drain was discharging into the lake, but that the proprietor stated his intention of installing a cesspool.

Patrick Moynehan, Raquette Lake House, Raquette lake, N. Y. This resort was inspected on June 17, 1908, and the inspector found that the sewage from this resort was discharged directly into Raquette lake.

On May 25, 1909, the attention of the proprietor was called to the fact that this was a direct violation of section 76 of the

Consolidated Public Health Laws and he was advised to provide some suitable means of sewage disposal involving sedimentation. On June 7, 1909, he called at the Department respecting this communication. He stated at that time his intention of building a sedimentation basin and asked for further information as to how it should be constructed. He was furnished with a blue print of the plan suggested for the sedimentation basins at Chautauqua lake, and Mr. Moynehan stated that the plant would be installed at once.

This hotel was reinspected on July 30, 1909, when it was found that conditions remained the same as reported in 1908. In the absence of the proprietor, the manager stated that sewage disposal works were to be installed shortly.

George Straight, Lake View House, Blue Mountain lake, N. Y. This resort was inspected on June 13, 1908, when the inspector found that the overflow pipe from the cesspool to the kitchen drain was discharging into a nearby creek, also that the privy was in an insanitary condition.

This hotel was reinspected on July 31, 1909, when it was found that the insanitary conditions referred to above were still unabated.

II SARANAC-ST. REGIS DISTRICT

Cascadeville, Essex County

H. H. Nye, Cascade Lakes Hotel, Cascadeville, N. Y. Premises were inspected on July 9, 1908, and inspector reported that sewage from this resort was discharged directly into lower Cascade lake. The outlet pipe extends some eighty feet into the lake and discharges sewage into a depth of twenty-five to thirty feet of water. On May 26, 1909, the attention of the proprietor was called to this insanitary condition and he was advised to install some suitable method of sewage disposal.

Reinspection was made of this resort on August 13, 1909, when the inspector found that the insanitary conditions referred to above still remained unabated, and reported that the soil and location seemed to be admirably suited for sewage disposal by subsurface irrigation and that there was no need whatever for any overflow of sewage into the lake.

Raybrook, Essex County

E. A. Harder, Raybrook House, Raybrook, N. Y. Premises were inspected July 10, 1908, and inspector found that this resort was just being rebuilt and the sewerage system was at the time of the inspection incomplete. He stated further that it was proposed to construct filter beds for the disposal of the sewage and that these improvements would be completed before the opening of the season of 1909.

This resort was reinspected in August, 1909, when it was found that the sewage disposal works above referred to had not been built, and that the sewage was discharged into an open ditch, flowing into a swamp. The proprietor, however, stated his intention of installing a settling tank.

Saranac Lake, Franklin County

John Harding, The Algonquin, Saranac lake, N. Y. Premises were inspected on July 10, 1908, and the inspector found that the water supply of this resort was obtained from lower Saranac lake and is subject to pollution by the discharge of sewage from an overflow pipe from the cesspool, the outlet of this overflow being about fifty feet from the lake water intake; also that there was a break in the sanitary sewer at the rear of the stable, the sewage being discharged on the surface of the ground at that point. On May 25, 1909, a letter was addressed to the proprietor calling attention to these insanitary conditions and recommending that an overflow cesspool should be built to intercept the overflow from the other cesspool and that the break in the sewer should be repaired.

This hotel was reinspected on August 10, 1909. The break in the sewer at the rear of the stable referred to above had not been repaired as requested. The other sewer was found in an insanitary condition, the sewage leaking out upon the ground for a distance of thirty feet below the cesspool, standing in pools and making the ground nearby very soggy. The sewage drains down into the lake at a point between the overflow pipe from cesspool and the water intake. The overflow pipe from the cesspool was clogged.

George LaBounty, Esperance House, Saranac lake, N. Y. This resort was inspected on July 11, 1908, and the inspector found that the insanitary conditions existing there were deplorable. A portion of the top of the cesspool had fallen in leaving a large hole. The cesspool had become clogged and the sewage flowed over the ground forming an insanitary, obnoxious and dangerous nuisance.

This resort was reinspected on August 10, 1909, when it was found that a new cesspool had been built and the old one filled in. The new cesspool was fifteen feet square and has an overflow pipe discharging into an open ditch. The sewage in the ditch was about five inches deep and flowed upon meadow land where it disappeared into ground within thirty feet of the ditch. The distance from the cesspool to the house is about 300 feet. The soil in which the cesspool was dug is quite impervious below the surface layer of sand but one foot deep. It appears that the sewage of this resort can be disposed of by subsurface irrigation, provided, however, that the piping system is spread over a sufficiently large area.

Corey's, Franklin County

C. H. Wardner, Rustic Lodge, Corey's, N. Y. This resort was inspected on July 14, 1908, and the inspector found that the cottage privies were a menace to the health of all the guests and that the sewage from the laundry is discharged into a ravine tributary to upper Saranac lake.

The proprietor was notified on May 28, 1909, to abandon these privies and install sanitary flush closets; also that the discharge of sewage into upper Saranac lake is a direct violation of section 76 of the Consolidated Public Health Laws, and advised to provide some appropriate way to prevent the discharge of raw sewage from his hotel into the waters of upper Saranac lake, such as some suitable means of sewage disposal involving sedimentation.

This hotel was reinspected on August 7, 1909, when it was found that the privies had been replaced by sanitary flush closets as recommended. It was found, however, that waste water was still being discharged into a nearby ravine from the laundry. The proprietor stated his intention of building a cesspool to intercept this discharge.

Paul Smith's, Franklin County

Phelps Smith, Treasurer, Paul Smith's Company, Paul Smith's, N. Y. This resort was inspected July 15, 1908, and the inspector found that the sewage from this resort was discharged into an open ditch and allowed to flow directly into St. Regis lake.

On May 25, 1909, the attention of the hotel company was called to this condition and to the fact that this discharge of sewage into St. Regis lake was a direct violation of section 76 of the Consolidated Public Health Laws, and they were advised to introduce some suitable means of sewage disposal involving sedimentation. On June 3, 1909, in response to their request they were again further advised as to the method of sewage disposal best adapted to this resort.

This hotel was reinspected on August 16, 1909, when it was found that the conditions were the same as had been previously reported. The inspector was informed, however, that the hotel company had sewage disposal plans under advisement.

Rainbow Lake, Franklin County

S. R. Fosburgh, Rainbow Inn, Rainbow Lake, N. Y. This resort was inspected on July 20, 1908, and the inspector found that the sewage was discharged directly into Rainbow lake. On May 25, 1909, the proprietor was notified that this was a direct violation of section 76 of the Consolidated Public Health Laws and he was advised to provide some suitable means of sewage disposal involving sedimentation.

This resort was reinspected in August, 1909, when it was found that sewage was still being discharged into the lake. The owner stated that the property was about to be sold and that the new owner contemplated making the necessary improvements.

F. C. Toof, The Garondah, Rainbow lake, N. Y. These premises were inspected on July 20, 1908, and the inspector found that the well from which the water supply of this resort is obtained is in danger of contamination. This well is a dug well and located in the cellar of the hotel, two privy vaults are 35 feet from the well and the cesspool is about 150 feet from it. On May 21, 1909, the proprietor was advised to abandon this well and to drive or dig another one at some point removed from the buildings, cesspool, privies, etc.

This resort was reinspected in August, 1909, when it was found that conditions remained as previously reported. The proprietor, however, was contemplating at that time to comply with the request of the Department at the close of the season.

L. R. Morris, The Brighton, Rainbow lake, N. Y. This resort was inspected on July 20, 1908. The inspector found that the water supply was taken from a well located under the main building. On May 21, 1909, the proprietor was notified that this location of the well was undesirable and was advised to abandon this well and drive or dig another well at some point removed from the buildings and other sources of pollution.

This resort was reinspected in August, 1909, when it was found that conditions remained as previously reported.

Ralph's, Clinton County

Andrew Morrison, Ralph's Hotel, Ralph's, N. Y. The premises were inspected on July 21, 1908, and the inspector found that the sewage from this resort was discharged directly into the Upper Chateaugay lake. On May 25, 1909, the proprietor was notified that this was a direct violation of section 76 of the Consolidated Public Health Laws and he was advised to provide some suitable means of sewage disposal involving sedimentation.

This resort was reinspected in August, 1909, when it was found that conditions remained as previously reported. The proprietor, however, stated that he had sewage disposal plans under advisement and that at the close of the season some definite improvement would be made.

NEW INSPECTIONS MADE IN 1909

In addition to the foregoing, original inspections were made of other summer resorts in the Adirondacks, the Catskills, and in the central part of the State covering practically all of Districts Nos. 2, 3, 4, and 9 listed above and beginning the work in District No. 12. The object of these inspections has been to ascertain the nature and extent of any insanitary conditions prevailing at the resorts and to collect such data as would enable the Department to make recommendations for the improvement of existing conditions or to issue orders to remedy insanitary conditions found.

For the purposes of this investigation, any hotel, or public camp or collection of cottages under one management, which is open for guests only in the summer season, or which relies chiefly upon the summer trade, was considered a summer resort. However, only those summer resorts were inspected which are rated at a capacity of twenty-five or more persons. Commercial hotels, the majority of whose patrons are attracted to the vicinity for purely business reasons, were excluded from the investigation.

In this investigation it was attempted to gain definite information as to the sanitary conditions of the summer resorts inspected in such detail and completeness as to enable the Department (1) to determine the nature and extent of any insanitary conditions found to exist, (2) to make intelligent recommendations or issue definite orders as to the effectual remedy of such conditions. The inspection of each resort was quite thorough, and all conditions which had any bearing upon the health of the guests or of the general public were noted and recorded.

The work of inspection was systematized by the use of printed blanks, folders prepared for this purpose, on which all the information collected was recorded. The data obtained in each case may be briefly summarized as follows:

1. Name, location and general description:
    a. Resort, proprietor and location relative to railroad, town, lakes or rivers, mountains, etc.
    b. Climatic and topographical conditions — temperature, character of surrounding country, adjacent waters, swamps, lowlands, prevalence of mosquitoes, soil and rock formation, etc.
    c. General description of buildings — number and kind, general construction and material, capacity, cellar, yard, stable, disposition of manure, propagation of flies, etc.

2. Water supply:
    - *a.* Source.
    - *b.* Distribution.
    - *c.* Quality.
    - *d.* Consumption.
3. Plumbing:
    - *a.* General type.
    - *b.* Condition of piping system.
    - *c.* Condition and location of fixtures.
4. Disposal of sewage:
    - *a.* General method with description of system, type, arrangement, etc.
    - *b.* Cesspools — number, size, location and construction.
    - *c.* Outfall sewers — point of discharge, character of sewage or effluent.
    - *d.* Privies — number, type, location, with respect to house, care and accessibility to flies.
5. Garbage disposal:
    - *a.* Collection.
    - *b.* Method and place of disposal.
6. Milk supply.
7. Communicable diseases.
8. Summary of insanitary conditions found and suggestions as to best means of correcting the same.
9. Plans and sketches.

In so far as it was practicable, the data obtained were based on actual inspection. However, if a water supply was taken from a spring at some distance from the resort and was removed from habitations, the spring was not visited. The proprietor or manager of each place was asked to show on the ground the location and the character of the different appurtenances of his establishment. Special emphasis was laid upon the value of comprehensive sketches, supplemented by special large sketches of undesirable or questionable conditions.

FULTON CHAIN — BIG MOOSE DISTRICT

This district, as may be noted from the accompanying general map, includes all or portions of the counties of Lewis, Herkimer, Hamilton and Oneida.

Sixty resorts in this district were inspected in 1909 and at forty-six of these insanitary conditions were found (some of them of relatively minor importance), or it was found that sewage was being discharged directly into lakes and streams.

The report of the inspector follows, together with a table, listing the resorts inspected.

ALBANY, N. Y., *August 26*, 1909.

MR. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report of the work of original inspection of summer resorts in the Adirondacks carried on under your direction during the present season in the Fulton Chain–Big Moose, the Raquette–Tupper–Long Lake and the Saranac–St. Regis districts.

The region inspected in the summer of 1909 includes practically all of the Adirondack park. In addition to this a section west of the park along the Black river, and a section north of the park, lying south of the towns of Malone and Moira were covered. The inspection extended over parts of Franklin, St. Lawrence, Lewis, Essex, Herkimer, Hamilton and Oneida counties. All of the resorts were reached from the stations on the New York Central Railroad from Trenton Falls to Malone and Harrisville, and on the Delaware and Hudson from Lake Placid to Lyon Mountain.

The work was started from the Beaver River station on the Adirondack division on June 18th. Mr. Cleveland was present for a short time to get the work started. Going on from Beaver river the following bodies of water were visited in order: Beaver lake, Big Moose lake, Twitchell lake, Dart's pond, Fulton Chain of lakes, Little Moose lake, Moose river, Otter lake, Long lake. White lake, West Canada creek, Brantingham lake, Black river. Long pond, Lake Bonaparte, Oswegatchie river, Raquette lake, Utowana lake, Blue Mountain lake, Long lake, Massawepie lake, Catamount pond, Tupper lake, Saranac lake, Spectacle lakes, Lake Placid, Mirror lake, Ausable river, Lake Clear, St. Regis Chain of lakes, Rainbow lake, Silver lake, Lake Duane and Lake Ozonia. A number of resorts were inspected which were not situated near any stream or lake.

The inspection was finished August 23, 1909.

Description of Inspection

In accordance with the letter of instruction received from you at the beginning of the work, the object of the inspection has been to ascertain the nature and extent of any insanitary conditions prevailing at the resorts and to collect such data as would enable the Department to make recommendations for the betterment of existing conditions or to issue orders to remedy the insanitary conditions found.

At your direction, the resorts inspected were those with a guest capacity of twenty-five or more, that cater to the summer vacation visitor and not commercial hotels or those that are open throughout the year as hotels accommodating transient guests. Further, resorts served by public water supply and sewer systems were not inspected with the exception of those at Lake Placid.

At Lake Placid all of the resorts use village water and sewer into the village sewers, but it was deemed advisable in this case to make this an exception and to have the customary inspection.

The inspection of each resort was quite thorough, all conditions which had any bearing upon the health of the guests or of the general public were noted and recorded. The work of inspection and the recording of the data was systematized by the use of printed blanks prepared by the Engineering Division, on which all of the information collected was recorded.

The tabulation of data (see appended tables) conformed to the following general outline:

1. Name, location and general description:
    - *a.* Resort, proprietor and location.
    - *b.* Temperature at resort, probable mean.
    - *c.* Adjacent waters, swamp, lowlands, with prevalence of flies or mosquitoes.
    - *d.* Description of surrounding country and of soil.

2. Yard, condition and use.
3. Stable, location, drainage, disposition of manure and propagation of flies.
4. Water supply.
    - *a.* Source.
    - *b.* Distribution.
    - *c.* Quality.
    - *d.* Consumption.
5. Plumbing:
    - *a.* General type.
    - *b.* Condition of piping system.
    - *c.* Condition and location of fixtures.
6. Sewage disposal.
    - *a.* General method.
    - *b.* Description of system.
    - *c.* Cesspools.
    - *d.* Outfall sewers and overflows.
7. Privies, location with respect to house, care and accessibility to flies.
8. Garbage disposal.
9. Milk supply.
10. Communicable diseases.
11. Summary of insanitary conditions found, and recommendations for means of betterment.
12. Sketch of surroundings.

The accompanying tables give in condensed form the principal items from the individual reports of each resort.

The presence of such a large number of privies in a region of this sort is very undesirable, but owing to circumstances in the majority of cases cannot be changed. The large number is due to the fact that resorts pipe their water from springs on the hills about, the pipes being just barely covered, if at all. In winter time the pipes get frozen, throwing the flushing system out of commission, when, of course, use must be made of outside privies. The privies were, as a rule, carelessly attended to, a fact which can be attributed to ignorance of the danger from flies. In all, eleven privies were found which were accessible to flies.

The discharge of sewage into the lakes was found to be quite general — twenty-eight cases of such pollution being recorded. At Fulton Chain, in particular, the pollution is almost universal.

There are very few cases where the problem of sewage disposal is at all difficult, and usually there is little excuse, beyond that of expediency, for the discharge of sewage into the lakes.

Garbage disposal at the resorts is usually given considerable care, although five cases of very insanitary disposal were encountered.

The water supply of the resorts is excellent, and there is very little pollution possible. A danger exists, however, where two sources are in use, one for potable supply and the other for toilet and laundry. The tap from a polluted supply in the house is a constant temptation to careless help. Five cases were found of poor or insufficient water supply.

The weekly reports give in detail the specific instances of insanitary conditions and recommendations and the appended table lists the resorts inspected.

Respectfully submitted,

G. R. B. SYMONDS,

Inspector

RAQUETTE — TUPPER — LONG LAKES DISTRICT

This district includes Raquette, Tupper and Long lakes, and adjacent territory as may be seen by a reference to the general map. A general description of the resorts in this district and of the character of the district is given on page 795 of the Twenty-ninth Annual Report of the Department. Five additional inspections of resorts were made in this district in 1909 as noted in the accompanying table, and insanitary conditions were found at two resorts.

SARANAC — ST. REGIS DISTRICT

This district includes all or portions of Franklin, Clinton and Essex counties as may be noted on the general map. A description of the district and of the general condition of the resorts may be found on page 796 of the Twenty-ninth Annual Report of the Department.

During the season of 1909, twenty additional resorts as listed in the accompanying table, were inspected and at nine of these resorts insanitary conditions were found or it was found that sewage was being discharged directly into streams and lakes.

CATSKILL — ALBANY DISTRICT

This district comprises a considerable area lying south and west of the angle formed by the Mohawk and Hudson rivers, and includes all or portions of Montgomery, Schenectady, Albany, Schoharie, Greene, Ulster and Delaware counties as may be noted by reference to the general map.

The general character of the resorts in this district, together with a description of the district, may be found on page 844 of the Twenty-eighth Annual Report of the Department.

One hundred and ninety-one original inspections of summer resorts were made in this district during the season of 1909. Of these 191 resorts insanitary conditions or cases of sewage discharge into streams were found at 136 resorts.

The report of the inspector and a tabulated list of the resorts inspected follow:

ALBANY, N. Y., *September* 9, 1909.

MR. THEODORE HORTON, *Chief Engineer State Department of Health, Albany, N. Y.:*

DEAR SIR:— I beg to submit the following report on the investigation of the sanitary conditions of the summer boarding-houses inspected in the Albany-Catskill district during the summer of 1909.

The work was carried on in the townships of Catskill, Cairo

and Hunter, including the towns and villages of Catskill, Leeds, Palenville, Kiskatom, Lawrenceville, South Cairo, Cairo, Purling, Acre, Haines Falls, Tannersville, Platte Clove, Elka Park, Onteora Park and East Jewett. So far as is known all the summer boarding-houses included in this district with a capacity of twenty-five or over were inspected with the exception of those few houses in Haines Falls and Tannersville which were inspected during the summer of 1907. The work was started on June 30, and was completed on September 4, and there were in all 191 houses visited.

During this investigation all houses run during the summer for boarding purposes and which accommodated twenty-five or more guests were included in the list, also those commercial hotels in the villages which cater very strongly to summer trade, with the exception in both classes of those houses which have both village water supply and are connected to a village sewer system.

It was the aim of the investigation to inspect each house fully along the lines laid out, and report every condition completely so that the Department might be clearly able to determine each insanitary condition, and understand how best they might be remedied so that they might be able to make intelligent recommendations to the proprietors of the various resorts. During the course of the season, it became quite evident that there were many houses which had temporary insanitary conditions, which very often were not evident at the time of the inspection, and so could not be reported for they would often happen to be remedied at the time of inspection.

In order to follow out the aim of the investigation the following data was obtained for each house and recorded on the blanks provided for the purpose. A brief summary of the data obtained is:

1. Location and general description:
   - *a.* Name of resort and proprietor and his address.
   - *b.* Location relative to railroads, boat lines or streams.
   - *c.* Climatic and topographical conditions.
   - *d.* General description of buildings, including construction, capacity and surroundings, with sketch showing relative location and distances of buildings, cesspools, privies, wells, springs and streams.

2. Water supply:
    - *a.* Source, surrounding conditions and possibility of pollution.
    - *b.* Distributing and storage system.
    - *c.* Quality of water.
    - *d.* Consumption.
3. Plumbing:
    - *a.* General type — open or closed, old or new.
    - *b.* Condition of piping system as to traps and vents.
    - *c.* Description and condition of each fixture.
4. Disposal of sewage:
    - *a.* General method.
    - *b.* Description of cesspools — number, size, location, construction.
    - *c.* Outfall sewers and effluent pipes — point of discharge, character of effluent.
    - *d.* Privies — number, by whom used, care and present condition.
5. Garbage disposal:
    - *a.* Condition of receptacles.
    - *b.* Disposal of garbage, rubbish and ashes.
6. Milk supply:
    - *a.* Source.
    - *b.* Receptacles used and how sterilized, storage of milk.
7. Communicable diseases:
    - Information relative to the outbreak of any communicable diseases, precautions against spread of consumption.

In all cases the inspection was made with the proprietor or one of his assistants, who was familar with the place. All conditions were inspected personally except those water supplies one-half mile or more up the mountains where there was no habitation above, and also those few outfall pipes down the sides of the steep Kaaterskill gorge.

The district inspected might be classified into two divisions. First, the low lands. Second, the mountains. In the first are the townships of Catskill and Cairo, and the second the township of Hunter.

In the low lands there is a more or less rolling country, the elevation, except in a portion of Cairo, being generally less than 500 feet. In this section there is a gravelly soil of varying depth and beneath generally shale or blue stone. Through a portion of Leeds there is a layer of limestone.

Through this region there seems to be sufficient water running through veins to supply the drinking and cooking purposes and the waters of Kaaterskill and Catskill creeks, or their tributaries for other supplies.

The fact that there is so much gravelly soil in this section makes the disposal of the sewage by means of cesspools a simple problem. In no case was it found that overflows were necessary, and very little difficulty was found with any of the cesspools.

In the mountain section, however, conditions are entirely different. In this section is situated the township of Hunter. Here there is a shallow surface loam running about two feet deep, and beneath that a subsurface layer of hardpan running very deep.

On these mountains the main water supplies come from springs, most of which are mountain springs or from the head waters of the creeks.

In this kind of soil there is very great difficulty with the disposal of the sewage. Most of the resorts dig cesspools, while a few, namely the two mountain houses and the houses in Twilight, Sunset and Santa Cruz parks, run their sewage directly down the side of the mountain. Where they have the cesspools it is either necessary to construct a regular overflow or let the cesspool become full and overflow. The proprietors find great difficulty with the proper method of disposing of the overflow. A few let it drain away under the surface though most of them let it run on top of the ground in ditches often collecting in small pools and causing great annoyance, while some few let it flow directly into a creek.

The accompanying table gives a complete summary of the result of the inspection of each house which was visited in this district.

By far the greater number of houses were located either on the side of the slope or on the top so that in most cases there was good drainage. Also barns were situated at a good distance from the house, with in almost every case the drainage away from the house. However privies and cesspools were frequently found crowded close to the houses where they could just as well be placed further away.

The surroundings of the house were for the most part good though in some cases the rear yards were very untidy and sometimes insanitary. This was especially true where the garbage was thrown out to chickens, and there allowed to decompose in part. Pig pens were always kept at a good distance from the house and frequently on another property so that there was little trouble with them.

The barns were in general kept in fair condition, those belonging to the larger houses kept in first class shape, though few barns had any regular system of drainage. In practically all cases the manure pile was allowed to accumulate throughout the entire summer and nothing was ever done to prevent the spread of flies, in fact few proprietors evidently ever thought of such an idea.

The water supply was obtained from several different kinds of sources though wells and springs predominated by far. Out of the 191 houses visited only sixteen were using a public water supply for all purposes and one of these was also using cistern water for drinking. There were three houses which had village water but were using well water for drinking though one of these wells was only five feet from a barn. Four houses used private club supplies, which in all cases came from springs and mountain brooks. Spring water supplied thirty-one houses for all purposes, two of these being questionable and seven houses used springs supplemented by other sources of which five were wells, three of them for drinking, one was a brook and one a cistern. There were nine houses using springs for their potable supply only, and for the washing and other purposes two of them used wells, two cisterns, three creeks and two lake water. There were thirty-five wells being used exclusively, seven of which were questionable, being located under buildings. Besides these eleven used wells for all purposes supplemented by other supplies for the washing and cleaning purposes, three of these being springs, four creeks, three cisterns and one using both cistern and springs. There were only four houses using cistern water for all purposes and two using wells in conjunction with them. Seven houses used spring and well water interchangeably for all purposes, two of them questionable, and one used these sources in conjunction with a creek for laundry purposes.

By far the larger number of houses had more than one supply using an inferior or questionable water for washing and cleaning purposes. Where these supplies were run into the house, there was the danger of people getting careless or sometimes being in a hurry so that they did not take time to obtain potable supplies which were often outside but would draw from some convenient tap. There were fifty-three of these houses using wells for potable supply, six of them questionable. For the other purposes twenty-six used cisterns, thirteen creek water, thirteen spring water and one both cistern and creek water. There were only nine places which used spring water for just the potable supply and of these, for other purposes, two used wells, two cisterns, three creeks and two lake water. Five houses used both spring and well water for their drinking and cooking supply, using spring, cistern, creek, cistern and creek, and lake for all other purposes.

Brook water supplied only three houses, two of which were from a mountain stream taken way above habitation and one of them from a brook which passes through a village just above the intake. I was unable to find any case of pollution in the creek by sewage though it was rumored that there was pollution by some of the private houses.

Plumbing.—A large number of the houses inspected were comparatively small, many of them being farm houses. Consequently there were a good many houses with no plumbing whatever and a majority of the rest with only plumbing sufficient to care for the slops and wash water. In very many cases this class of plumbing was cheaply and poorly put in. Where there was modern plumbing with toilets, bath, lavatories, etc., the soil pipe was carried above the roof except in four cases, though sometimes at a reduced size. However, there were very many houses which did not have a trap in the main drain, eighty-eight in all. A partial explanation for this number is that many drains had exposed ends in those cases where the only plumbing they had were kitchen and slop sinks, or in these same places if they did have cesspool they did not appreciate the importance of preventing the gases getting into the house. Then, too, there were many houses in this number which had modern plumbing throughout, but without any trap. This was especially true in Haines Falls where the plumber who does the work for most of the houses has a theory that there ought to be a clear line from the cesspool to the top of the soil pipe so as to ventilate the cesspool, and so he installs all his systems accordingly. In many cases where the main drain was trapped there was no fresh air inlet.

The separate fixtures were generally trapped though often kitchen or dish washing sinks did not have them. However, it was found that only two houses had all the traps vented and two with part of the traps vented.

In all, there were 130 houses which had plumbing fixtures in them, 99 open, 16 closed and 15 both open and closed. Forty-two had a main drain trap and 88 did not. There were 58 houses which had general plumbing which might be called good, 39 fair and 33 poor.

One of the troubles seemed to be that where only a little plumbing was installed, such as two or three sinks, it did not seem important enough to the proprietors to take the care or give the attention that they would if a more complete system were installed and so many deficiencies appeared.

Sewage Disposal.— The sewage was disposed of in various ways. In the older country houses where there was no plumbing, the most general way was to throw the slops on the ground in general, not near the house or in any one special place, though some of the houses were exceedingly careless with this method of disposal. Another plan used by these houses was to throw the slops either in the privy or on the manure pile. Of these houses, there were forty-nine which threw the slops on the ground, four in the privies, five both in privies and on the ground and four on the manure pile. There was also another method used where slops was carried out in pails, and that was by digging a hole in the ground, sometimes sinking a barrel or box part way in it to form a basin, and then filling the hole with loose stones. In this way the waste water was allowed to filter through the stones into the ground. This method seemed to work well except in one case where solid matter in the dish water clogged up the hole so that the water percolated through with very great difficulty. There were six houses which used this method of disposal of slops.

In those houses which had only sinks in the line of plumbing very often the wastes were run into creeks or through stone drains, some of which emptied on the surface or in ditches and allowed to seep into the soil. Also a few of them used cesspools, none of these having overflows. Seventeen houses ran their sewage in stone or tile drains, the effluent of twelve appearing on the surface.

In houses where there was a more or less complete system of plumbing, where excremental wastes had to be disposed of, the favorite method was cesspools, though a few run it into creeks or down the mountainside. The most of the cesspools in this class of resorts had to have overflows. Where these overflows were run into subsurface drains and so allowed to run into the soil there was no difficulty; but many times the overflow was allowed to run out on the ground with the result that they very frequently became a nuisance and often drained in direction of creeks if they did not run directly into them as some did.

Respecting stream pollution, it was found that many proprietors had no consideration for the rights or health of others who were below them on the streams. The statement of one proprietor who was running his sewage into a creek that " It is all right for me," seemed to express the attitude of many others who were doing a similar thing, especially where the water was being used below for water supplies.

There were in all seventy-five houses using cesspools, five of them in conjunction with some other method. Of this number, forty-two of them had no overflow, being built in gravelly soil. Of the thirty-three with overflows, fourteen run them into subsurface drains where they disappeared. Eighteen of the overflows appeared on the surface, some of them to drain over ground, some to stand in puddles and some to run in ditches. There were seven overflows which were run into a creek. Twenty houses ran their sewer directly into creeks, though all of these did not have excremental wastes running into the sewer. The streams affected were Catskill, Kaaterskill and Schoharie creeks. Three houses ran their sewage down the sides of the Kaaterskill Clove, and two down the mountain side.

There were two resorts which had a concrete settling tank and overflow tank which served as a dosing tank and from which the effluent ran through pipes and on the ground a good distance from the house.

Privies are the rule rather than the exception through the Catskills, for I found 168 resorts having privies out of the 191 visited. Of course, there were many of these houses which also had modern toilets and had the privies for emergency or help.

The greater majority of privies had dirt vaults, and next in number were those with removable wooden boxes. There were 112 resorts having privies with dirt vaults, 23 with the wooden boxes, 8 resorts which had both dirt vaults and wooden boxes. There were one, two or three houses, each having stone, brick, cement or wooden vaults or a combination of these. Two privies were set up over a creek bed.

The most of the privies visited were in fairly good condition, possibly partly due to the very light season, and possibly in measure because that region in which there were the most privies, especially those with the dirt vault, was visited during the first part of the season. The privy houses were more often dark and unventilated than otherwise, a small slit being deemed all that was necessary.

In the case of the removable boxes, it was found that when the best of care was not taken of them, as was often the case, the wood became saturated and even when clean had a strong odor.

Many of the proprietors who have these types of privies realized their deficiencies and were very particular about them, though many who have had and used them all their lives were not at all careful about them and did not give them the attention they ought. One lamentable fact is that generally where there were privies used exclusively for help, they were given little or no attention whatever so that they were not fit for anyone to go into.

The best type of privy vaults were found on the mountains where there were nine houses with coal scuttles or large pails under the seats and which were each day emptied. In one resort there was kept a box of dry dirt by each seat to be constantly used. This privy was on the second floor of the house proper and gave no more odor than well-regulated toilets.

Taking the entire number of resorts with privies, there were seventy-three which had good privies, forty-six fair and fifty bad.

Most of them were tight around the bottom and had covers on the seats so that they were not readily accessible to flies.

The universal method of disposal was to bury it, though a few put it on the fields to be plowed under. In many of the old houses the privies are not cleaned frequently enough, many of them only once a year and a very few even less often.

The garbage was not at all well looked after with the result that there was often an abundance of flies around in the kitchen or in the rear. So many fed it to their stock, taking it out two or three times a day, that no special care was taken of the receptacles, most of them being open pails, pans and barrels. Where the ordinary swill barrel was in use, it was very seldom covered, in fact there were 148 houses using open receptacles.

The disposal was, in general, good. One hundred and thirty-three resorts fed it to stock, fifty-one had it collected, two buried, two burned, one on manure pile, one in slop hole and one down the banks of the creek.

Milk Supply. Since the country inspected is a farming locality for the most part, most of the proprietors, or 102 of them, had their own cows, while 12 of them had their own cows as well as obtained it from dealers; and the rest of the houses, the majority being on the mountain, got their milk from local dealers. Where the proprietors had their own cows, the cow stables were especially looked into while examining the barns.

It was found to be almost a universal rule to scald the cans after each milking, though there were two house-wives who did not seem to think it absolutely essential to use even hot water.

In the country houses the milk was often kept on racks suspended from the ceiling in the cellar, though in most cases it was kept in an icebox or icehouse or separator.

Respectfully submitted,

HIRAM G. CONGER,

Inspector

CENTRAL — FINGER LAKES DISTRICT

The investigation of the sanitary condition of summer resorts in the central part of the State has been carried on under the direction of Prof. H. N. Ogden, Special Assistant Engineer in this Department, from whose report the following descriptive matter in regard to the Central–Finger Lakes District has been abstracted:

In this district the summer hotels are usually small and unpretentious, in no case approaching the magnificence of those on Lake Champlain, in the Adirondacks or in the Catskills. This is probably due partly to the absence of large cities in the vicinity, partly to the lack of advertising and to the modest ideals of the proprietors, and possibly to the fact that those places offering natural scenic attraction are not situated on the main railroad lines.

For the most part, the summer hotels in the central district are grouped around the lakes, which are characteristic of this district, although on the hill tops south of Syracuse are two hotels far removed from any water. But it is around the flat shores of Oneida lake, on the seven Finger lakes and on the shore of Lake Ontario that the hotels are to be found.

The topography in the vicinity of Lake Ontario, extending southeast to include Oneida lake, is quite different from that in the vicinity of the Finger lakes, being that of a low, flat plain not much above the level of the lake. The shores in the vicinity of Oneida lake are in some places marshy, in others sandy, but always flat. A bluff rises from Lake Ontario although it is much cut, especially at Great Sodus and Little Sodus bays, by marked and much broken indentations. Back of the bluff the land is flat, extending southerly from ten to twenty miles.

The Finger lakes, on the contrary, are bounded by high hills, reaching an altitude, in many places, of 1,000 feet above the water level, with deep water close in shore, and with level building sites only at the mouths of the tributaries where the deltas have been pushed out into the lake.

The climate is affected by tho presence of the water, showing a lower temperature in winter and a higher temperature in summer, to the manifest advantage of the summer resorts. The hillsides are thus able to raise fruits, not possible in more exposed positions, and tons of grapes and many thousand bushels of apples are shipped from this favored region.

The soil in the Finger lake region is a glacial drift, sometimes clay, sometimes gravel and sand, and more often a mixture of all three, with large boulders interspersed. The underlying rock is limestone or shale on the hills, with the valleys filled many hundred feet deep with drift.

Underground water can always be found in the valley drift, and a number of summer resorts secure their drinking water from wells sunk into this material. A number of other resorts secure their water supply from small streams which find their way over the rocks, down the hillsides into the lakes on which the hotels are situated. Still others are in villages where a municipal water supply from a stream or pond is available. In nearly all of the cases, the water supply has been good with but little chance of pollution, while the methods of sewage disposal have been generally inadequate and incomplete, if not dangerous to health.

A number of the hotels inspected were fully equipped with modern sanitary apparatus, although not a few still have antiquated methods for the disposal of their wastes. Particularly are the objectionable features of sewage disposal to be found in the case of hotels on such of the Finger lakes as have the waters protected by water rules. In many cases, such hotels have been built almost at the water's edge, discharging directly all the hotel wastes into the lake, although such discharge is prohibited, and the waters of the lake are used for drinking purposes by the cities or villages on its shores.

The following description of the districts inspected is divided into sections according to the body of water near which the several hotels are located.

Oneida Lake

Oneida lake, itself, is a lake about twenty-three miles long and five or six miles wide, located in the central part of New York State. The long axis of the lake is east and west, and its shores bound the counties of Oswego, Oneida, Madison and Onondaga.

The greater number of the summer resorts are at Sylvan Beach on the eastern end of the lake, where there is a fine sandy bathing beach. The lake has good fishing grounds, and for this reason summer hotels are found in many towns along both shores of the lake. The prevalent winds on the lake are from the west.

The altitude of the lake is 370 feet above sea level. The shores are low on the south side, but on the north side they rise to quite an altitude, the land on both sides being largely cultivated. The soil is a loam with gravel. The temperature along the lake varies from ten degrees below to about ninety degrees above zero.

There are several towns along the lake, some on its shore and others back a mile or so. Those near the lake are Sylvan Beach, Upper South Bay, Brewerton, Lewis Point, Lower South Bay, Cleveland and Constantia. Those back from the lake are Bridgeport and North Bay. A great many hotels in these towns discharge their sewage into the lake, except at Sylvan Beach, where cesspools are used. Even here, however, there are three hotels which discharge into the inlet of the lake.

The water supply of Sylvan Beach comes from a reservoir located about a mile and a half northwest of the village. This reservoir is fed by springs and by a hill stream flowing through swamps and bogs, the water often being discolored from vegetable pollution, and there are places where it flows through cultivated fields and pasture land. The water is piped from the reservoir to the village. The health authorities of the town claim that it is pure, as shown by State tests, but there is much complaint from the village people using the water, and it would seem desirable to examine the quality of the water more at length. Nearly all of the hotels visited at Sylvan Beach use village water, and are generally poorly equipped against dangers from fire.

The hotels on the south side of the lake are divided among the small villages of South Bay, Lakeport, Bridgeport, Maple Bay, Lower South Bay and Brewerton. None of these villages have public water supplies, and the water is generally obtained from dug wells from 14 to 75 feet deep. In some cases these wells were obviously polluted, the wells being in close proximity to cesspools or privies, and in a few cases, the taste of the water was distinctly disagreeable. In other cases, the wells seemed to be free from pollution. These hotels are chiefly patronized by fishing parties and have none of the modern conveniences peculiar to the modern summer hotel. They have been inspected, however, and are here included to make the list of hotels in this region as complete as possible.

Otisco Lake

Otisco lake is a rather shallow lake about five and a half miles long and three-fourths of a mile wide. It is located in the central part of New York State, being in Onondaga county. The lake lies in a northwestern by southeastern direction, its inlet being at the southern end. A viaduct used as a roadway crosses the lake at its southern end.

The altitude of the lake is 784 feet above the sea level, and the immediate shores are generally low, rising slightly from the water's edge. The ground is cultivated in the valley bottom, as far back as the hills.

The soil is clayey, and ground water is reached at from eight to ten feet below the ground level. The temperature varies from about ten degrees below zero to ninety degrees above.

There are practically no towns of any size along the lake. Several small hamlets, such as Marietta, Amber and Zealand, are to be found near the lake. In these towns the water carriage system of sewage disposal is little used, and earthen privies take care of most of the human wastes.

As most of the hotels use outside privies, there is little sewage going into the lake. Considerable waste water, etc., is, however, discharged into this body of water. None of the hotels take their drinking water from the lake, but the Syracuse Suburban Water Company has acquired the right of drawing a supply from this lake.

The general condition of the hotels along this lake was very bad, especially with regard to the disposal of wastes. In general, the hotels are of very poor and cheap construction, and there was practically no fire protection.

Skaneateles Lake

Skaneateles lake is a lake about sixteen miles long and half a mile wide, lying in the central part of New York State. On its shores are the counties of Onondaga and Cayuga. The lake lies in a northwestern by southeastern direction, its inlet being at the southern end.

The altitude of the lake is about 867 feet above the sea level, and its shores rise gradually, developing at the southern end of the lake into hills of 1,000 feet in height. Along the shores of the lake there is some cultivated ground, especially on the east side, but near the water's edge and also on the west side there is much forestation.

The soil is of a loamy variety, and ground water is encountered from twelve to thirteen feet below the surface. The temperature varies from a maximum of eighty-five degrees above to fifteen degrees below zero.

There are practically only two towns on the lake, one at the head of the lake, called Glen Haven, and the other at the foot, known as Skaneateles. Of these, Glen Haven is very small, while Skaneateles has a population of about 1,500. There are six hotels along the lake, three in the town of Skaneateles, and three in Glen Haven. Of these, the two largest and most important are the Glen Haven Hotel, at the upper end of the lake, having a guest capacity of 250, and the other, the Packwood Hotel, having accommodations for sixty guests.

Owasco Lake

Owasco lake is about eleven miles long and one mile wide, running north and south and entirely in the county of Cayuga. The altitude of the lake is 710 feet above the sea level. The shores are low at the northern end, but become very abrupt at the southern end where the lake is almost inclosed by the high hills. The valley and hillsides are cultivated. The watershed being practically all deforested contributes large quantities of storm water to the lake after every shower. Auburn, a city of about 40,000 population, is at the north end of the lake, about two miles distant therefrom, and there are two or three small settlements on the west side of the lake. The Lehigh Valley railroad runs close to the water's edge along this side, furnishing ready access to the villages before mentioned, and to numerous cottages which are found along the water's edge from one end of the lake to the other.

On the lake there are but two hotels, one known as the Ensenore Hotel at the railroad station of the same name, and the other, known as the Cascade Hotel, also located on the railroad line, While both of these hotels are ostensibly open for guests, neither of them practically are running, the properties having been allowed to deteriorate, and inducements to guests not being sufficient. On account of the danger to the Auburn city water supply, the commissioners of that city have installed for each hotel a sewage disposal plant of primitive construction, which prevents the sewage reaching the lake water directly. Both hotels have satisfactory water supply, have modern plumbing and might be made into comfortable, though unpretentious, summer hotels.

Cayuga Lake

Cayuga lake is a lake about forty miles long and from one to three miles wide, lying in the central part of New York State. In depth it varies from 50 to 140 feet. The lake runs north and south and bounds the counties of Tompkins, Seneca and Cayuga.

The altitude of the lake is 381 feet above the sea level, and its shores are mostly rather low or slightly rising banks on the west side, and rather steep hills on the east side. The hills are mostly uncultivated on the west side, with many forests, while on the east side, up on the hills, are cultivated lands.

The soil is mostly a clayey loam with quite a little gravel. Ground water is found from eight to twelve feet below the ground level. The temperature varies from ten degrees below zero to ninety degrees above.

Along the lake are quite a number of small towns. Those on the west side are from one-half to two miles back from the lake, while on the east side, most of the towns are close to the lake. The largest town on the lake is Ithaca, a town of about 14,000 population, located at the inlet of the lake.

A large amount of sewage is discharged into the lake, both from towns and from hotels. None of the hotels or towns, however, take their drinking water from the lake, except Seneca Falls. Passenger boats running on the lake during the summer discharge their sewage directly into the lake.

the junction of the two branches of this lake. Most of these hotels are inadequately protected against danger from fire.

Canandaigua Lake

Canandaigua lake is a lake about sixteen miles long and about one mile wide, lying in the central part of New York State. The lake runs approximately north and south and bounds the counties of Ontario and Yates.

The altitude of the lake is 686 feet above the sea level and its shores are mostly low and slightly rising from the west bank and much higher on the east. The land along the lake is only partly cultivated. The soil is a loam with shale.

There is practically only one village of any size on the lake and this is Canandaigua, located at the foot of the lake. The sewage of Canandaigua does not enter the lake, but within six or eight miles of it there are many privies and other sources of pollution, located close to the water's edge. Although the hotels do not discharge their sewage into the lake a number of them empty their waste water into it. These hotels are generally inadequately protected against danger from fire.

Lake Ontario

Lake Ontario is about 180 miles long and 45 miles wide. The part inspected in this district is located in the counties of Wayne, Cayuga and Oswego.

The altitude of the lake is about 300 feet above the sea level. At the part of the lake inspected, the shores were either rather low or gradually sloping. The land is mostly cultivated. The soil is either sandy loam or a clayey gravel.

There were four places visited in this district, namely, the villages of Sodus Point, Fair Haven, North Fair Haven and Mexico Point. At all of these places some sewage discharged into the lake. A very noticeable thing at all these summer resorts was the large amount of swampy land near the hotels, giving rise to many mosquitoes, and often a bad odor.

Although the village of Sodus Point affords no protection against danger from fire, practically all of the hotels at that place were inadequately protected from fire.

SOUTHERN DISTRICT

As may be noted by a reference to the general map this district comprises the counties of Sullivan, Orange, Rockland, Dutchess, Putnam and Westchester counties and the southerly portion of Ulster county.

It has not been possible to carry on an extended inspection in this district as yet although, on account of complaints received, an inspection of a resort near Stevensville was made and thirteen resorts in this section were inspected in 1909.

Of these thirteen resorts, eight were found to maintain insanitary conditions or to discharge sewage directly into streams.

The report of the inspector follows:

ALBANY, N. Y., *June* 29, 1909.

Mr. THEODORE HORTON, *Chief Engineer, State Department of Health, Albany, N. Y.:*

DEAR SIR: — I beg to report that during the period of June 19–23, I visited those resorts in Sullivan county located in the town of Stevensville which were listed in the letter of instructions and also nine others which were not in the list, but which I found, making a total of thirteen resorts.

The list of resorts and proprietors is as follows:

1. Halcyon Hotel, Miss Mary Keogh.
2. Goff's Mountain View House, Gromer Goff.
3. Rock Spring Lodge, Alden S. Swan.
4. Crystal Spring House, Julius Baker.
5. Stony Hill Farm House, J. Steinberg.
6. The Alpine House, Geo. H. Bracy.
7. Carelton Villa, Mrs. A. Carelton.
8. McCormick House, Mrs. G. McCormick.
9. Lennon House, Joseph Lennon.
10. The Criterion, Mrs. K. L. Plunkett.
11. The Netherlands, Richard Soule.
12. Takoma, Mrs. F. Foy.
13. The Sherwood, F. W. Sherwood.

Respectfully submitted,

HIRAM G. CONGER,

Inspector

THEODORE HORTON,
Chief Engineer

INVESTIGATION OF METHODS OF GARBAGE DISPOSAL IN NEW YORK STATE

ALBANY, N. Y., *December* 28, 1909.

EUGENE H. PORTER, M.D., *State Commissioner of Health,*
Albany, N. Y.:

DEAR SIR:— In accordance with your directions, I beg to submit the following report of an investigation made by the Engineering Division during the past year to secure information as to the methods of collection and disposal of garbage and refuse in the larger municipalities of the State. This investigation was carried on largely by correspondence and the results are printed herewith in tabular form.

Circular letters were first addressed to the health officers of the various cities and villages listed in the table, asking information on the following points:

1. What means or methods are employed or utilized in the disposal of garbage or swill.

2 What means or methods are employed or utilized in the disposal of refuse other than garbage, swill or ashes.

3 What means or methods are employed in the disposal of ashes.

4 If the means or methods used were sanitary or otherwise satisfactory.

In cases where early replies were not received, second and third letters were sent calling attention to the original inquiry and further requesting the desired information.

It is obvious that data as to garbage and refuse disposal obtained in this manner could hardly be complete, but the table presents many interesting and in some respects important facts concerning the question of garbage and refuse disposal in most of the larger municipalities of the State.

Respectfully submitted,

THEODORE HORTON,
Chief Engineer

Municipality	COUNTY	CONDITION OF WASTES		METHODS OF COLLECTION						FREQUENCY OF GARBAGE COLLECTIONS	
				GARBAGE		ASHES		RUBBISH			
		Separate	Mixed	Municipal	Private	Municipal	Private	Municipal	Private	Summer	Winter
CITY											
Albany	Albany	X			X		X		X		
Amsterdam	Montgomery	X		X		X				semiweekly	
Auburn	Cayuga										
Binghamton	Broome	X			X		X		X		
Cohoes	Albany		X							Weekly and semiweekly	
Corning	Steuben				X		X		X		
Cortland	Cortland				X		X		X		
Dunkirk	Chautauqua										
Elmira	Chemung										
Fulton	Oswego										
Geneva	Ontario				X		X		X		
Glens Falls	Warren				X						
Gloversville	Fulton			X		X				Semiweekly	Weekly
Hornell	Steuben				X		X		X		
Hudson	Columbia	X		X		X			X	Semiweekly	
Ithaca	Tompkins	Xy		X		X		X			
Jamestown	Chautauqua			X				X			
Johnstown	Fulton			X			X		X	Semiweekly	
Kingston	Ulster	X		X	X						
Little Falls	Herkimer										
Lockport	Niagara	X		X		X	X	X			
Middletown	Orange		X		X		X		X		
Mount Vernon	Westchester			X	X						
Newburgh	Orange			X		X		X			
New Rochelle	Westchester										
Niagara Falls	Niagara										
N. Tonawanda	Niagara									Semiweekly	
Ogdensburg	St. Lawrence				X						
Olean	Cattaraugus										
Oneida	Madison				X		X	X			
Oswego	Oswego				X		X		X		
Plattsburg	Clinton				X		X		X		
Port Jervis	Orange	X			X		X		X		
Poughkeepsie	Dutchess			X							
Rensselaer	Rensselaer			X		X		X			
Rochester	Monroe	Xy	Xz	X		X		X			
Rome	Oneida	X		X		X		X			
Schenectady	Schenectady										
Syracuse	Onondaga	Xy	Xz	X		X		X			
Tonawanda	Erie	Xy									
Troy	Rensselaer		X	X		X					
Utica	Oneida	X		X						Triweekly	Semiweekly
Watertown	Jefferson	Xy		X			X		X		
Yonkers	Westchester			X		X					
VILLAGE											
Addison	Steuben				X						
Akron	Erie				X						
Albion	Orleans				X	X	X				
Alexandria Bay	Jefferson									Daily	
Amityville	Suffolk										
Attica	Wyoming										
Avon	Livingston										
Babylon	Suffolk		Xz							Daily	
Baldwinsville	Onondaga				X		X				
Ballston Spa	Saratoga										
Batavia	Genesee				X						
Bath	Steuben				X						
Boonville	Oneida										
Brockport	Monroe				X	X					
Canajoharie	Montgomery		X	X		X		X		Weekly.	
Canandaigua	Ontario				X		X		X		
Canastota	Madison				X	X		X			
Canton	St. Lawrence										

Methods of Garbage Disposal							Disposal of Ashes		Disposal of Rubbish		Remarks by Health Officer as to the Methods of Disposal of Wastes
Cremated	Burned	Fed to swine	Buried	Plowed under	Dumped	Grease Extracted	Grading highways	Dumped	Burned	Dumped	
...	......	X	......	......	......	......	......	X	......	X	
...	......	X	......	......	......	......	......	X	......	......	
...	......	......	......	X	......	......	......	Xa	......	X	Sanitary and satisfactory
...	......	X	......	......	Xb	......	......	Xa	......	......	
...	......	......	......	......	X	......	......	X	......	X	Sanitary and satisfactory
...	......	X	......	......	X	......	......	X	......	X	
...	X	X	......	X	......	......	......	......	......	......	Satisfactory
...	......	X	......	......	X	......	......	X	......	X	Neither sanitary nor satisfactory
X	......	......	......	......	Xe	......	......	Xa	......	Xc	Sanitary and satisfactory
...	......	X	......	......	......	......	......	Xc	......	......	Sanitary but not satisfactory
...	......	X	......	......	......	......	......	Xa	......	Xa	Sanitary but not satisfactory
...	X	X	......	......	Xe	......	......	Xc	X	Xc	Sanitary and satisfactory
...	......	......	......	......	Xe	......	......	Xe	......	......	
...	......	......	......	......	......	......	......	......	X	Xc	Satisfactory
...	......	X	......	......	Xd	......	X	Xa	......	Xa	Not satisfactory
...	......	......	......	......	Xb	......	X	Xa	......	Xa	Satisfactory
...	X	......	......	X	......	......	......	......	X	Xb	Satisfactory.
...	......	......	......	......	Xe	......	X	Xae	X	Xc	Sanitary and satisfactory.
...	......	X	X	......	......	......	X	Xa	X	Xb	Sanitary and satisfactory.
...	......	......	......	......	Xb	......	......	Xae	X	......	Sanitary and satisfactory.
...	......	X	......	......	......	......	......	Xa	......	Xa	Neither sanitary nor satisfactory
...	......	......	......	......	Xc	......	......	Xc	......	Xc	Not satisfactory.
...	......	X	X	......	......	......	......	Xa	......	Xc	Satisfactory.
...	......	......	X	......	......	X	......	Xa	......	......	Satisfactory.
...	......	......	......	......	Xac	......	......	Xae	......	Xac	Not satisfactory.
...	......	......	......	......	Xe	......	X	Xa	......	......	
...	......	......	......	X	......	......	......	Xa	......	Xb	Satisfactory.
...	......	X	......	......	......	......	X	......	......	Xa	Neither sanitary nor satisfactory
...	......	......	X	......	......	......	......	......	X	Xa	Satisfactory.
...	......	......	......	......	......	......	......	......	......	Xc	Sanitary and satisfactory.
...	......	X	......	......	......	......	......	Xa	X	......	Neither sanitary nor satisfactory.
...	......	X	......	......	......	......	......	Xa	......	......	Satisfactory.
...	......	X	......	......	......	......	......	Xc	......	Xc	
...	......	X	......	......	Xd	......	......	Xc	......	Xc	Sanitary and satisfactory.
...	......	X	......	......	......	......	......	Xa	......	Xc	Sanitary and satisfactory.
...	......	......	......	......	......	X	X	Xa	X	......	Sanitary and satisfactory.
...	......	X	......	......	......	......	......	Xc	......	Xc	Sanitary and satisfactory.
...	......	......	......	......	Xc	......	......	Xc	......	Xc	Sanitary but not satisfactory.
...	......	......	......	......	......	X	......	Xac	......	Xac	
...	......	X	......	......	Xd	......	X	......	X	......	Sanitary and satisfactory.
...	......	X	......	Xb	......	......	......	Xb	......	......	Neither sanitary nor satisfactory
X	......	......	......	......	......	......	......	Xa	X	......	Sanitary and satisfactory.
...	......	X	......	......	......	......	......	Xa	......	......	Sanitary and satisfactory.
X	......	......	......	......	......	......	......	Xa	......	......	Sanitary and satisfactory.
...	......	X	......	......	Xd	......	......	Xa	X	......	Sanitary and satisfactory.
...	X	X	X	......	......	......	......	Xa	......	Xa	Satisfactory.
...	......	X	......	......	......	......	......	Xa	......	......	
...	......	X	......	......	......	......	......	Xc	......	Xc	Sanitary and satisfactory.
...	......	X	X	......	Xd	......	X	Xa	X	X	Sanitary and satisfactory.
...	......	X	......	......	......	......	......	Xa	......	......	Sanitary and satisfactory.
...	......	X	......	......	......	......	X	Xa	......	X	
...	......	X	......	......	......	......	......	Xa	......	Xa	Sanitary and satisfactory.
...	......	X	......	......	......	......	......	Xa	......	......	Neither sanitary nor satisfactory
...	X	......	X	......	Xd	......	......	Xa	......	......	Fairly sanitary and satisfactory
...	......	......	......	......	Xd	......	......	Xa	......	......	Sanitary.
...	......	X	......	......	......	......	......	Xa	X	......	Partly sanitary and satisfactory.
...	......	......	......	......	Xe	......	......	Xe	......	Xe	Satisfactory.
...	......	......	......	......	Xe	......	X	......	......	......	
...	......	......	X	......	......	......	......	Xe	......	Xe	
...	......	X	......	......	X	......	......	X	......	X	Sanitary and satisfactory.
...	......	X	......	......	......	......	......	Xa	......	Xa	Sanitary and satisfactory.
...	......	X	......	......	......	......	X	......	X	......	Sanitary and satisfactory.

Municipality	COUNTY	CONDITION OF WASTES		METHODS OF COLLECTION						FREQUENCY OF GARBAGE COLLECTIONS	
				GARBAGE		ASHES		RUBBISH			
		Separate	Mixed	Municipal	Private	Municipal	Private	Municipal	Private	Summer	Winter
VILLAGE—*Con.*											
Carthage	Jefferson					X		X			
Catskill	Greene	Xy									
Casenovia	Madison			X		X					
Charlotte	Monroe				X		X				
Chatham	Columbia									Semiweekly.	
Clayton	Jefferson			X						Weekly.	
Clifton Springs	Ontario										
Clyde	Wayne				X						
Cobleskill	Schoharie										
Cold Spring	Putnam	Xy	Xz							Weekly.	
Corinth	Saratoga									Triweekly.	
Cornwall-on-H.	Orange										
Coxsackie	Greene				X		X				
Croton-on-Hud.	Westchester			X		X		X		Semiweekly.	
Cuba	Allegany									Triweekly.	
Delhi	Delaware	Xy		X		X				Semiweekly.	Weekly
Depew	Erie		X	X		X		X		Weekly.	
Deposit	Broome										
Dobbs Ferry	Westchester										
East Aurora	Erie										
East Syracuse	Onondaga										
Ellenville	Ulster			X							
Elmira Heights	Chemung				X		X		X		
Fairport	Monroe				X		X				
Falconer	Chautauqua				X						
Fishkill Landing	Dutchess			X						Weekly.	
Fort Plain	Montgomery									Triweekly.	
Frankfort	Herkimer				X						
Fredonia	Chautauqua				X				X		
Freeport	Nassau				X						
Gowanda	Cattaraugas and Erie	X			X						
Granville	Washington				X						
Green Island	Albany	Xy	Xz	X						Weekly.	
Hamburg	Erie				X		X		X		
Hammondsport	Steuben				X						
Hancock	Delaware										
Hastings-on-H.	Westchester									Semiweekly.	
Haverstraw	Rockland										
Hempstead	Nassau										
Herkimer	Herkimer				X						
Holley	Orleans				X						
Homer	Cortland	X		X							
Hoosick Falls	Rensselaer			X		X		X		Weekly.	
Ilion	Herkimer	X	X								
Irvington	Westchester										
Keeseville	Clinton and Essex										
Lancaster	Erie										
Larchmont	Westchester		X								
Le Roy	Genesee										
Lestershire	Broome				X						
Liberty	Sullivan				X					Daily	Triweekly.
Lowville	Lewis										
Lyons	Wayne						X		X	Daily.	
Malone	Franklin				X						
Mamaroneck	Westchester										
Massena	St. Lawrence										
Matteawan	Dutchess										
Mechanicville	Saratoga									Semiweekly.	
Medina	Orleans	Xy	Xz	X							
Mohawk	Herkimer										
Monticello	Sullivan										
Moravia	Cayuga	Xy			X						
Mt. Kisco	Westchester	Xy		X						Semiweekly.	

METHODS OF GARBAGE DISPOSAL							DISPOSAL OF ASHES		DISPOSAL OF RUBBISH		Remarks by Health Officer as to the Methods of Disposal of Wastes
Cremated	Burned	Fed to swine	Buried	Plowed under	Dumped	Grease Extracted	Grading highways	Dumped	Burned	Dumped	
...	......	......	......	......	......	......	......	Xa	......	Xa	
...	......	......	......	......	Xb	......	......	Xb	X	......	
...	......	......	......	......	Xc	......	......	Xc	......	......	
...	......	X	......	......	Xac	......	......	Xac	......	......	
...	......	......	......	......	Xa	......	......	Xa	......	Xa	Reasonably satisfactory.
...	......	......	......	......	Xc	......	X	......	......	Xa	Satisfactory to Board.
...	......	X	......	......	......	......	X	......	X	......	Sanitary and satisfactory.
...	......	X	......	......	......	......	......	Xa	......	Xa	
...	X	X	......	......	X	......	......	Xc	......	......	Sanitary and satisfactory.
...	......	......	......	......	Xc	......	......	Xa	......	Xa	
...	......	X	......	......	Xc	......	......	......	......	......	Satisfactory.
...	X	......	......	......	X	......	X	X	......	......	Neither sanitary nor satisfactory.
...	......	X	......	......	Xa	......	X	Xa	......	......	Sanitary and satisfactory.
...	......	......	......	......	Xc	......	......	Xc	......	Xc	Sanitary and satisfactory.
...	......	X	......	......	......	......	......	......	......	......	
...	......	X	......	......	......	......	X	......	......	......	Sanitary and satisfactory.
...	......	......	X	......	......	......	......	Xb	......	Xb	Sanitary and satisfactory.
...	......	......	......	......	Xc	......	X	......	......	......	Not very sanitary nor satisfactory
...	......	......	X	......	......	......	......	Xa	......	......	Sanitary and satisfactory.
...	X	......	......	......	......	......	X	Xa	X	......	Sanitary and satisfactory.
...	......	......	......	......	Xb	......	......	Xb	......	Xb	Sanitary and satisfactory.
...	......	X	......	......	......	......	X	Xa	......	......	Sanitary andsatisfactory.
...	X	......	X	......	......	......	X	X	......	X	Satisfactory
...	......	......	......	......	X	......	......	X	......	......	Neither sanitary nor satisfactory.
...	......	X	......	......	Xd	......	......	X	......	X	Neither sanitary nor satisfactory.
...	......	......	......	......	Xa	......	......	Xa	......	......	Sanitary and satisfactory.
...	......	......	......	......	X	......	......	Xa	......	......	Fairly sanitary and satisfactory.
...	......	X	......	......	Xc	......	......	Xc	......	Xc	Sanitary and satisfactory.
...	......	X	......	......	......	......	......	Xc	......	Xc	Sanitary and satisfactory.
...	......	......	X	......	Xa	......	......	Xa	......	......	
...	......	X	......	......	......	......	......	Xa	X	......	Satisfactory.
...	......	......	......	......	X	......	......	X	......	X	Neither sanitary nor satisfactory.
...	......	......	......	......	Xc	......	......	Xc	......	Xc	Sanitary but not satisfactory.
...	X	X	......	......	......	......	......	Xa	......	......	
...	......	X	......	......	......	......	......	X	......	X	Not up to the standard.
...	......	X	......	......	......	......	......	Xc	......	......	Sanitary and satisfactory.
...	......	......	......	......	Xa	......	......	Xa	......	......	
...	......	......	......	......	Xb	......	......	Xb	..	Xb	Neither sanitary nor satisfactory.
...	X	......	X	......	......	......	......	Xa	......	......	Neither sanitary nor satisfactory.
...	......	......	......	......	X	......	......	Xa	......	Xc	Not satisfactory.
...	......	X	......	......	......	......	Xa	......	......	X	Sanitary and satisfactory.
...	......	X	......	......	Xa	......	......	Xa	......	......	Not entirely satisfactory.
...	......	......	......	......	Xb	......	......	Xb	......	X	Sanitary and satisfactory.
...	......	......	......	......	Xc	......	......	Xca	......	......	Satisfactory.
...	......	X	......	......	......	......	......	Xa	......	Xa	Satisfactory.
...	......	X	X	......	Xd	......	X	......	......	X	Sanitary and very satisfactory.
...	......	......	......	......	X	......	......	X	......	X	Neither sanitary nor satisfactory.
...	......	......	......	......	Xa	......	......	Xa	......	Xa	Sanitary and satisfactory.
...	X	......	X	......	......	......	......	......	X	......	Fairly sanitary and satisfactory.
...	......	X	......	......	......	......	......	Xb	......	Xb	Satisfactory.
...	......	X	......	......	......	......	......	Xa	X	......	Sanitary and satisfactory.
...	......	X	......	......	......	......	......	Xa	......	Xc	Sanitary and satisfactory.
...	......	X	......	......	Xd	......	......	......	......	......	Fairly satisfactory.
...	......	X	......	......	......	......	X	......	......	......	Sanitary.
...	......	......	......	......	Xb	......	......	Xa	......	......	
...	......	X	......	......	X	......	......	Xa	......	......	Neither sanitary nor satisfactory.
...	......	......	......	......	Xb	......	......	Xa	......	Xa	Satisfactory.
...	......	......	......	......	......	......	......	Xa	......	......	Sanitary and satisfactory.
...	......	X	......	X	......	......	......	Xca	......	Xca	Sanitary and satisfactory.
...	......	......	......	......	Xcb	......	......	Xc	......	......	
...	......	X	......	......	Xa	......	......	Xa	X	Xc	Neither sanitary nor satisfactory.
...	......	X	......	......	......	......	......	Xa	X	X	Sanitary.
...	......	X	......	......	......	......	......	Xa	X	......	Sanitary and satisfactory.

Municipality	COUNTY	CONDITION OF WASTES		METHODS OF COLLECTION						FREQUENCY OF GARBAGE COLLECTIONS	
				GARBAGE		ASHES		RUBBISH			
		Separate	Mixed	Municipal	Private	Municipal	Private	Municipal	Private	Summer	Winter
VILLAGE—*Con.*											
Mt. Morris	Livingston										
Newark	Wayne				X		X		X		
Northport	Suffolk										
N. Tarrytown	Westchester		X							Weekly.	
Norwich	Chenango										
Nyack	Rockland	X	X		X						
Ossining	Westchester		X		X		X		X		
Owego	Tioga	Xy			X						
Oxford	Chenango				X						
Palmyra	Wayne	Xy			X				X	Semiweekly.	
Patchogue	Suffolk				X		X				
Peekskill	Westchester			X		X		X		1-6 times per week.	
Penn Yan	Yates						X				
Perry	Wyoming				X						
Philmont	Columbia			X		X				Semiweekly	
Pleasantville	Westchester				X		X		X		
Port Chester	Westchester			X		X		X			
Port Henry	Essex				X						
Potsdam	St. Lawrence				X						
Rhinebeck	Dutchess						X	X			
Rockville Center	Nassau				X				X		
Rye	Westchester			X					X		
Sag Harbor	Suffolk										
St. Johnsville	Montgomery				X						
Salamanca	Cattaraugus				X						
Sandy Hill	Washington				X						
Saranac Lake	Essex and Fr'k'n										
Saratoga Spgs.	Saratoga										
Savannah	Wayne				X						
Scotia	Schenectady										
Sea Cliff	Nassau	Xy	Xz	X		X		X		Daily	Semiweekly
Seneca Falls	Seneca		X	X	X	X					
Sidney	Delaware				X						
Silver Creek	Chautauqua				X						
Skaneateles	Onondaga										
Solvay	Onondaga									Weekly.	
Southampton	Suffolk										
So. Glens Falls	Saratoga			X							
South Nyack	Rockland				X					Semiweekly	Weekly.
Spring Valley	Rockland										
Springville	Erie						X				
Stamford	Delaware and Schoharie		X							Daily	
Suffern	Rockland										
Tannersville	Green		X		X						
Tarrytown	Westchester			X		X		X		Semiweekly.	
Ticonderoga	Essex				X						
Tuckahoe	Westchester									Weekly.	
Tupper Lake	Franklin										
Walden	Orange										
Walton	Delaware										
Wappingers Falls	Dutchess						X				
Waterloo	Seneca									Weekly.	
Waterville	Oneida										
Wellsville	Allegany										
Westfield	Chautauqua						X				
W. Haverstraw	Rockland										
White Plains	Westchester										

Xa Dumped for filling.
Xb Dumped for filling and covered.
Xc Dumped on public dumping ground.
Xd Dumped for fertilizer.

METHODS OF GARBAGE DISPOSAL							DISPOSAL OF ASHES		DISPOSAL OF RUBBISH		Remarks by Health Officer as to the Methods of Disposal of Wastes
Cremated	Burned	Fed to swine	Buried	Plowed under	Dumped	Grease Extracted	Grading highways	Dumped	Burned	Dumped	
					Xe		X	X		Xe	Sanitary and satisfactory.
					X			X			Neither sanitary nor satisfactory.
					Xe			Xa		Xc	Neither sanitary nor satisfactory.
					Xb			Xe	X		Sanitary and satisfactory.
					X			Xa			Satisfactory.
		X						Xa		Xa	Neither sanitary nor satisfactory.
					Xa			Xa		Xa	Fairly sanitary not satisfactory.
	X	X						Xe	X		Sanitary but not satisfactory.
		X						X			Neither sanitary nor satisfactory.
		X						Xa		Xa	Not entirely sanitary nor satisf'y.
		X			X			X			Sanitary and fairly satisfactory.
					X			X		X	Neither sanitary nor satisfactory.
		X						Xae		Xe	Neither sanitary nor satisfactory.
		X			X			Xa			Sanitary and satisfactory.
					Xe			Xe			Sanitary and satisfactory.
		X	X		Xe		X	Xe			Sanitary and satisfactory.
					Xb			Xa	X	Xa	Not satisfactory.
		X	X		Xd			Xa		Xa	Sanitary and satisfactory
		X					X	Xa		Xe	
	X	X			Xd			Xe		Xe	Well cared for
					X		X	X	X		Not sanitary
			X								Sanitary and satisfactory
					Xf		X			X	Sanitary
		X						Xa		Xb	Satisfactory
		X						Xf	X	Xe	Sanitary
	X	X						Xe		Xe	Neither sanitary nor satisfactory
	X		X					Xa		Xa	Satisfactory
	X	X			Xe			Xe	X	Xe	Sanitary and satisfactory
					X			Xa		Xd	Sanitary and satisfactory
			X					Xa		X	Sanitary and satisfactory
			X				X		X		Sanitary and satisfactory
		X			Xd			Xa	X	X	Neither sanitary nor satisfactory
		X					X	X		X	Neither sanitary nor satisfactory
	X	X						Xa		Xa	Sanitary and satisfactory
	X	X	X					Xa			Sanitary and satisfactory
			X					Xe		Xb	Sanitary and satisfactory
		X					X				Not perfect
		X	X					Xae			Sanitary but not satisfactory
		X					X	Xa		Xe	Sanitary and satisfactory
			X				X	Xa		X	Fairly sanitary and satisfactory
					Xd					X	Sanitary and satisfactorv
		X						X		X	Sanitary and satisfactory
					Xb			X		X	
	X	X					X	X		X	Neither sanitary nor satisfactory
					Xb			Xb		Xb	
		X					X	Xe		Xe	Fairly sanitary and satisfactory
	X				Xb				X	X	Neither sanitary nor satisfactory
	X							Xa		Xa	Sanitary and satisfactory
	X							Xe		Xe	As sanitary as possible
							X			X	Not sanitary
					Xb			Xa		X	Sanitary and satisfactory
		X					X	Xe			Not sanitary
					X			Xa		X	Neither sanitary nor satisfactory
	X				X				X	X	Neither sanitary nor satisfactory
		X						X		X	Neither sanitary nor satisfactory
					Xb					X	Sanitary and safe
					Xb			Xb		Xb	Sanit'y and satisf'ty in winter.

Xe Dumped in large bodies of water.
Xf Dumped in back yards.
Xy Garbage and wastes.
Xs Ashes and refuse.

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